THE MARINE REVIEW

THE WM. E. COREY CARRYING FIRST CARGO THROUGH THE NEW LIVINGSTONE CHANNEL

VOL. 42 CLEVELAND NOVEMBER, 1912 NEW YORK No. 11

Bulk Freighter Keybell

Description of the First Vessel Which the Keystone Transportation Co. Has Built in Canada

THE Collingwood Shipbuilding Co., Collingwood, Ont., has recently completed the bulk freighter Keybell for the Keystone Transportation Co., of Montreal. Considering the great difficulty which the shipbuilding company had in obtaining material, owing to the crowded condition of the mills, the steamer was built in remarkably short time. The contract was signed April 4, the launch took place Sept. 17, and the vessel was turned over to the owners on Oct. 15. She is built to the classification of the British Corporation for the Survey and Registry of Shipping, of which Capt. James B. Foote, of Toronto, is the Canadian representative.

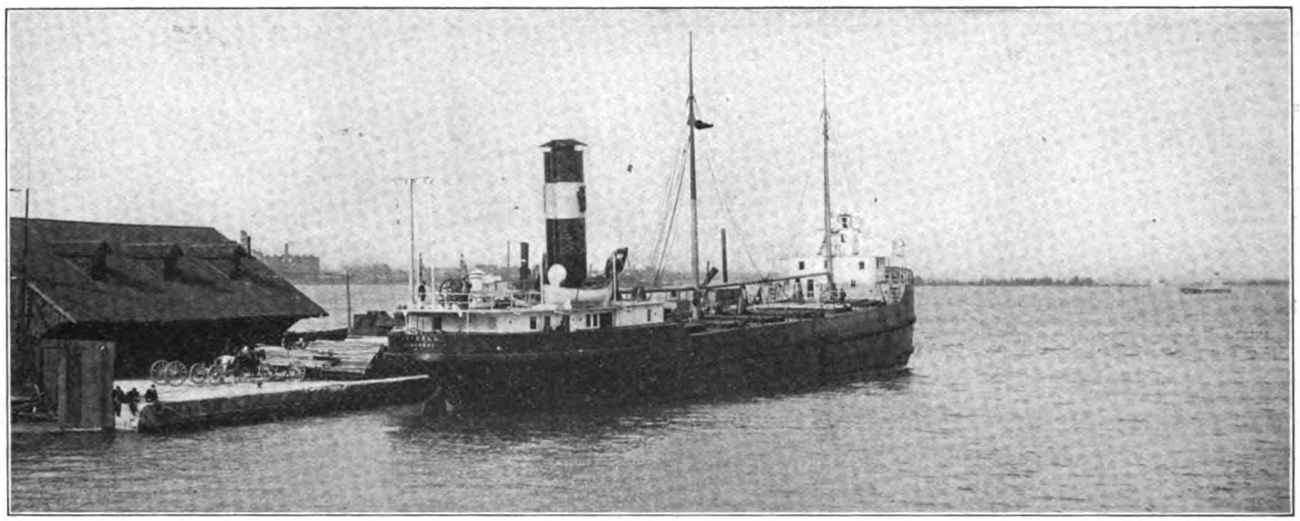
The steamer's dimensions are:

Length over all	258 ft.
Length B. P.	244 ft.
Breadth, moulded	42 ft. 6 in.
Depth, moulded	20 ft.

The vessel is built on the arch and web frame system, dispensing with hold pillars, leaving the holds unobstructed, facilitating the handling of bulk cargoes of coal and ore with clam-shell unloaders. The arches and webs are spaced 24 ft. centers, the arch plate being 30 in. deep of 15 lbs. plate, connected to web frame of same weight, 22 in. deep, with large bracket at tank margin, these with the deep floor plate in double bottom forming a belt frame around the ship. These arches, being connected to the main deck plating by large brackets, also support the main deck beams, making ample provision for heavy deck loads of pulpwood. The regular framing, between the webs, consists of solid 13-lb. plate floors in double bottom, space 4 ft., with intermediate angle floor frame and reverse frames, side frames 7 in. and 18-lb. channel spaced 2 ft., well bracketed to tank margin and to main deck beams of same section and spacing, to take the strains incident to canaling. The frames for 40 ft. from stem are spaced 18 in. centers, which, with the numerous panting beams and the panting stringers, afford additional protection to the hull against ice damage. The bottom framing is supported longitudinally by three lines of 13-lb. plate intercostals and the side framing by three lines of side stringers, composed of channel bars intercostalled to shell. The bottom shell and the tank top plating is exceptionally heavy for a vessel of this size, as a margin against bottom damage on full canal draught and damage to the double bottom plating by the heavy grab buckets now in use. The tank margin at its junction with the shell is below the level of the tank top, providing a capacious bilge well, into which the bilge suctions are fitted, as a precaution against leakage through damage to side shell in locks finding its way into the cargo holds, the bilge ceiling being fitted watertight. The forward hold, which is most liable to this sort of damage, has been fitted with grain ceiling as a protection against moisture, this being fitted in hatches and arranged, by an ingenious system of bolting, to be easily removed for inspection and painting of the adjacent steel work.

Five bulkheads are fitted, three watertight and three screen, the cargo hold being divided into three compartments. An additional partition

THE KEYBELL, LOOKING AFT



THE KEYBELL, LOOKING FORWARD

bulkhead is fitted between the boiler and machinery spaces. All deck houses and machinery casings and the engine skylight are steel, the deck over the after house being extended to shelter main deck.

The stem, stern frame and rudder frame are of wrought steel, the stern frame being scarphed below the boss to facilitate repairs in case of damage to the shoe, the scantlings of the latter being also very heavy. The rudder is of the side plate type, with counterbalance, coupled to the head below counter, the coupling being designed to permit of unshipping the rudder without disturbing the steering gear keyed to the stock above.

Location of Machinery

The machinery is located right aft, the engine being bedded on the tank top, and the scantlings of the double bottom increased in way of engine bed to afford rigid foundation. The boilers are also placed on the tank top, with firehold at forward end of boiler space. The bunkers, with capacity for 140 tons of coal, are located on the main deck over the boilers, arranged to coal from spouts through hatch in cabin deck, with saddle-back chute into the pocket bunkers at each side of firehold.

A second deck is fitted for a short distance aft, the starting platform, from which the main engines are handled, being at the same level with the engineers' store and tool rooms at aft end of machinery space.

Watertight scuttles are fitted in the main deck, over cargo bulkheads, with Jacob's ladder to holds, and a wrecking well of steel plate fitted in two of the holds.

Five cargo hatches, each 28 ft. 6 in. by 12 ft., spaced 24-ft. centers, and the after hatch 28 ft. 6 in. by 20 ft., afford ample facilities for the rapid handling of cargo. The hatch covers are of 3-in. Norway pine, supported by strongbacks and fore and afters of rock elm and are provided with double tarpaulins of waterproof canvas.

There are two steel masts with one cargo derrick fitted to the fore, and two to the main mast, of three tons capacity, with cargo whips led to 6 in. by 8 in. single-drum hoisting winches of Collingwood Shipbuilding Co.'s design, the running gear being of flexible crucible steel wire in B. & L. blocks.

A fender of 11 in. by 9 in. rock elm is fitted, full length of the ship, just above the load line, and another of same scantlings, around the stern at main deck level.

The double bottom is divided by watertight cross divisions and watertight center keelson into seven compartments for water ballast, these with the fore and after peaks totaling 990 tons.

Auxiliary Equipment

The ballast pumping arrangements consist of a 9 in. by 10 in. by 10 in. duplex vertical ballast pump, placed in the lower engine room on port side of ship, piped to pump, through manifold placed at forward end of engine room, into or out of each compartment of the double bottom, the suction to each low pressure being a 5-in. wrought iron pipe. Two bilge pumps driven directly from low-pressure cross-head are connected up to a special bilge manifold having 2½ in. suction to bilge wells in each hold and in boiler space. A 6-in. flood valve is fitted in the tank top in forehold for purpose of flooding or draining the hold. There are also two 6-in. hold drains located in No. 3 hold to draw from off the tank top in the cargo space and connected to main ballast manifold. The plumbing system throughout the vessel is supplied by a 4 in. by 4 in. by 5 in. horiontal duplex sanitary pump in the engine room, three large fresh water storage tanks being connected to this line for use in port, affording an ample supply of pure water at all times.

The steering gear is by Messrs. John Hastie & Co., Greenock, the engine being placed aft on lower deck adjacent to the engine room and direct connected to the quadrant, which is on the Wilson-Pirrie principle. The gear is controlled from stands in pilot house and on bridge by wire rope transmission and a hand gear, with two large teak wheels, is fitted at after end of cabin deck to control the vessel, when in an emergency, the forward gear is thrown out by a clutch. A spare tiller and relieving tackles are also supplied, connected to rudder head above main deck.

An Emerson-Walker patent quick-warping direct-grip windlass is installed on the forecastle head, the ground tackle consisting of two 36 cwt. Bower anchors, one stream and one kedge anchor, all Sykes Britannic stockless, with chain cables and steel wire hawsers to requirements of the British Corporation, the Bower anchors being arranged to stow in anchor pockets, entirely within the hull. The deck machinery, in addition to the hoisting winches already mentioned, consists of two mooring machines, by the builders—one 8 in. and 10 in. double-drum placed on main deck amidships, and one 6 in. by 8 in. single-drum right aft on the main deck, the chocks and other accessories being arranged about as usual in canal steamers.

A steel snubbing cable is fitted with

reel on forecastle head, controlled by an Angrove cable compressor, for warping in the locks. The spars consist of a spear pole at stem head and flag poles forward and aft. The outfit includes two 22 ft. Watts metallic lifeboats, equipped with Huff's patent disengaging hooks, placed on cabin deck under davits arranged to travel transversely, with links and guides, which permits of more rapid handling of the boats than by means of swinging davits and also avoids placing davits and boat skids close to rail, where they are always liable to damage when lying alongside docks or other vessels. A complete outfit of life saving apparatus, fire hose, etc., to pass government inspection, has been supplied, also awnings over pilot house, over main deck forward and over crew's quarters aft, oil and electric signal lamps, cabin lamps, navigating instruments, flags, mate's and carpenter's stores and cooperage.

Cabin Arrangements

The accommodations for officers, owners and crew are first-class, the after house containing galley, pantry, refrigerator and crew's mess, dining room and quarters for chief and second engineer, steward and oilers and firemen. The dining room is panelled in oak, with panelled pine ceiling and the officers' rooms finished in birch. Floor in galley is of cement with wood floors covered with linoleum in living rooms. Trunk skylights are fitted over dining room and galley and screens provided for all doors and windows. The quarters forward under forecastle deck, contain, on the port side, mates', wheelsmen's, deckhands' and watchmen's rooms, store and officers' bath and crew's hall. On the starboard side are the owners' quarters, consisting of a sitting room entered from the main deck, two staterooms and bath. Above this, on the forecastle head, is the texas, containing captain's office, stateroom and bath, and forward of this, a handsome observation room for the owners' use. The captain's and owners' rooms and the observation room are half panelled in birch, mahogany finish, with V. G. wainscot and wide base and chair rail below, the ceiling being panelled in pine, painted flat white, this making a very fine finish. Above the texas is the pilot house, arranged particularly for canal service, of ample proportions and with a good area of glass, providing for the navigation of the vessel from the inside, the engine and docking telegraphs being placed here. Speaking tubes lead from pilot house to deck over and to captain's room.

The plumbing and heating installation is first class in every particular and ample for the service. Running hot water is also provided in the galley, captain's and owners' quarters and crew's shower.

Electrical Equipment

The electrical installation consists of one 6 K. W. Holmes engine and dynamo, direct connected, placed on running deck engine room on port side of ship. The equipment consists of about 100 lights, with conduit installation throughout the holds and engine room, all to the requirements of the British Corporation. On deck there are eight positions for portable lights, for working cargo by night, also plugs located right forward and aft for convenience in taking draughts. Ample light is provided in the holds by means of four lamps at each cargo hatch, placed close to deck, well out of the way. The forward end is controlled by eight-circuit panel box, fitted in crew's hall, and the after end by another eight-circuit panel box located in stairway to engine room. Electric tell-tales fitted in pilot house to indicate when the navigation lights fail. Running lights and the telegraphs and binnacles are fitted for both oil and electric light. The whole installation has been carefully laid out to insure ample light in all rooms, and also to include the exterior of the deck houses and the machinery space.

Propelling Machinery

The main engine is vertical, triple-expansion, surface-condensing, having 16-in., 26-in. and 44-in. diameter of cylinders by 36 in. stroke with direct connected Edward's air pump, feed and bilge pump. The surface condenser is of cast iron, embodied with the back column in the design of the engine. There are two boilers 11 ft. 6 in. diameter by 10 ft. 6 in. long built for 180 lbs. working pressure and equipped with the Howden system of forced draft.

The auxiliary machinery in the engine room consists of one 9 in. by 10 in. by 10 in. duplex vertical circulating pump, one 9 in. by 10 in. by 10 in. duplex vertical ballast pump, one 8 in. by 4 in. by 10 in. horizontal duplex auxiliary feed and fire pump, one 4 in. by 4 in. by 5 in. horizontal duplex sanitary pump and one 6 K. W. generating set direct connected to vertical engine for the electric light service of the ship.

The owners were represented by Messrs. John Reid & Co., naval architects, of Montreal. The vessel will be sailed by Capt. J. J. Murray, late of steamer Keyport, with J. H. McMillan as chief engineer.

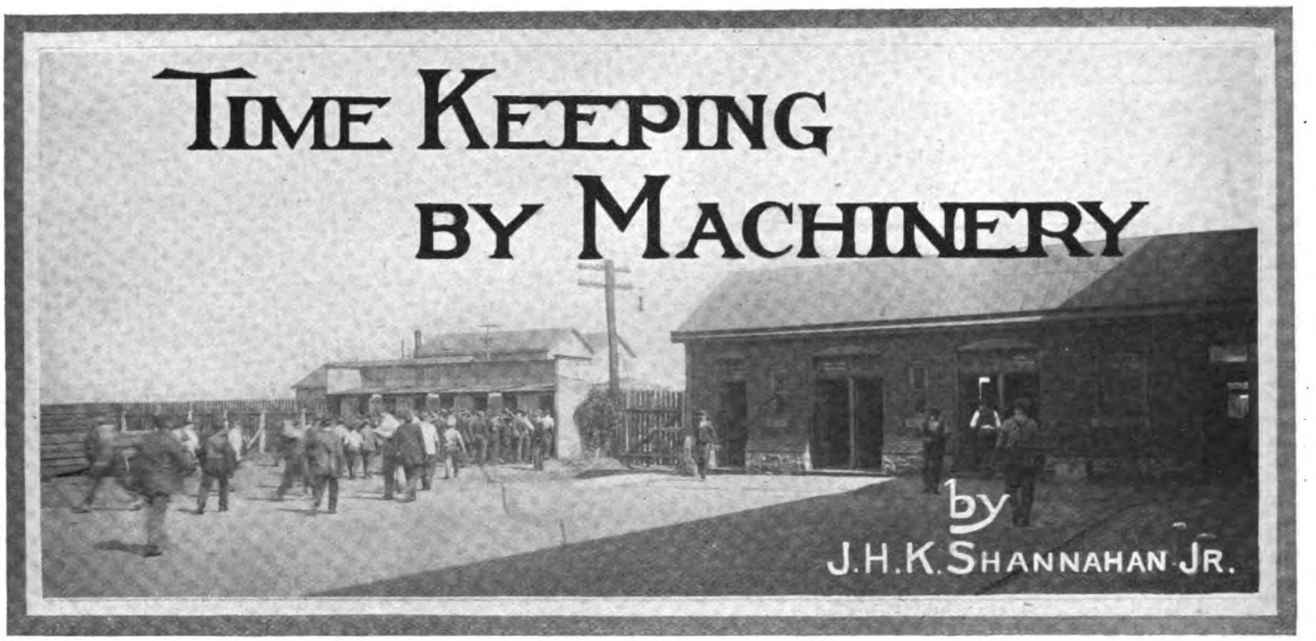
Lifting Trial of Medway Dock

The final lifting trial of the Dreadnought dock, built by Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne, for the British admiralty, took place in the River Medway on Oct. 2, when the British battle-cruiser Lion, displacing 30,415 tons and drawing 31 ft. 6 in. of water was successfully docked and lifted. The actual lifting operation of the dock from a draught of 31 ft. 6 in. until the pontoon deck was awash at the sides occupied three hours and ten minutes. The total distance through which the vessel was lifted was 36 ft. and the total quantity of water necessary to be pumped in order to raise the deck of the dock clear of the water was about 46,000 tons. After the vessel had been cleaned and painted and some necessary repairs had been effected, the dock was lowered the following morning at 8 o'clock and the ship was undocked during the day. The operation of lifting this huge battle-cruiser was one of the greatest interest, as no ship of similar displacement has ever been lifted out of the water by a floating dock. The time occupied in lifting the vessel was well within the limits prescribed by contract.

The Seattle Construction & Dry Dock Co. is building from plans by Cox & Stevens, naval architects, of New York, an ocean-going steam yacht surpassing in size any similar craft now in Pacific waters, for D. C. Jackling, of Salt Lake City. The vessel will be constructed of steel and will be finished throughout with teak and mahogany. The yacht will be of the following dimensions: Length over all, 212 ft.; length at water line, 205 ft.; breadth, extreme, 27 ft.; breadth at deck, 26 ft. 6 in.; depth, molded, about 15 ft. 6 in. The vessel will be equipped with two 4-cylinder triple-expansion engines, supplied with steam by Babcock & Wilcox water-tube boilers.

Bids for the construction of the six torpedo boat destroyers for the United States navy, which were to have been opened on Oct. 31, will be held up until Nov. 18, pending a careful study of the opinion of the attorney general and the eight-hour law as applied to the construction of material for use in naval vessels.

TIME KEEPING BY MACHINERY



THE question of keeping an accurate and trustworthy record of the time made by employes has always been a difficult one to solve satisfactorily. The larger the number of men involved the greater has been the problem. It is not only a case of getting an accurate record of the actual time each man has made as the basis for his pay, but the distribution of his wages to the proper charge account. This has always been a troublesome matter and involving much detail work with a larger array of clerks than the manufacturer cares to see around.

Various methods for keeping time have been tried. The one most common is that of the time-keeper who makes regular trips about the works and from his own observation and from information furnished by the various foremen, obtains the number of hours made by each man. This is unsatisfactory and is frequently inaccurate, besides, there is abundant room for a time-keeper and a foreman, if they are dishonest, to pad the rolls.

All of these problems seem to have been most successfully dealt with by the marine department of the Maryland Steel Co., at Sparrows Point. In this department alone, there are over 2,000 men employed, hence any system which they have developed may be safely assumed to be thoroughly practicable.

A bold step was taken by virtually making each man his own time-keeper. This was made possible by the introduction of a card system operated in conjunction with time clocks. At the entrance to the yard are the clock houses, and the only entrance and exit for the yard is through these houses. To better handle the large number of men there are eight houses, over the doors of each of which is a sign showing the range of numbers whose holders will use that entrance or exit.

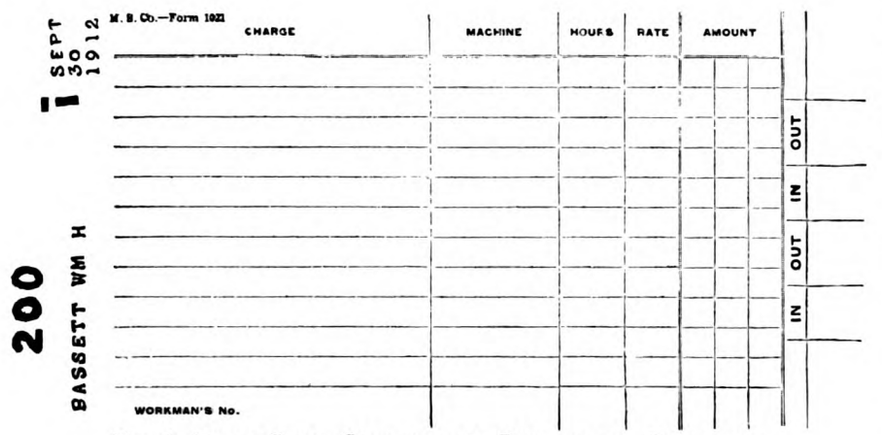
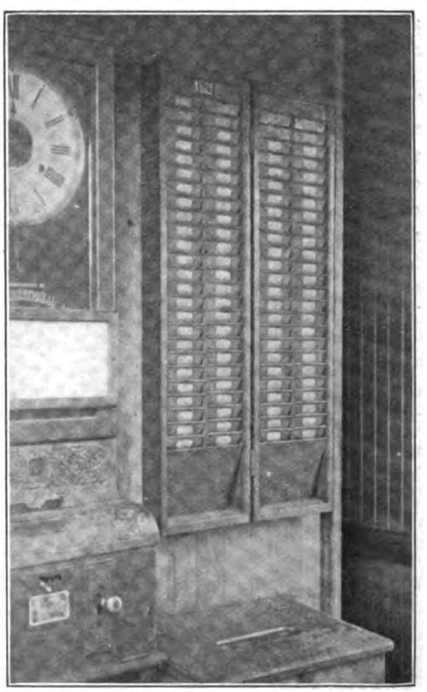


FIG. 1—DAILY CLOCK CARD AND THE BASIS OF ALL OPERATIONS

On one side of the narrow hallway there is a clock and the card rack. The most obtuse foreign laborer knows his working number, for he thoroughly understands that without it he cannot receive his pay envelope. As his card is always in the same place in the rack and bears his working number in large figures as well as his name, it is but a second's work for him upon going to work in the morning to take his card from the rack, insert it in the clock and place it back properly in the rack.

A word about the card used. This is reproduced in Fig. 1. As will be



TIME CLOCK AND CARD RACK

The Maryland Steel Company Pay Roll Week Ending

NAMES OF EMPLOYEES	S	M	T	W	T	F	S	Hours	Wages	Store	Rent	Doctor	B A	Cash	Balance

FIG. 2—TOP OF PAY ROLL SHEET, SHOWING ARRANGEMENT

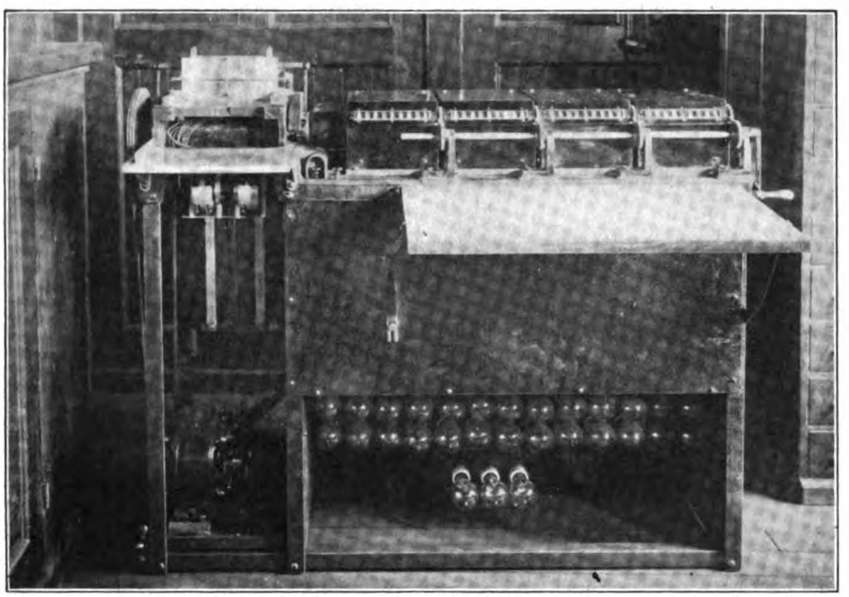
observed, a new card is used each day. At first weekly cards were tried, a single card being used by a workman for a whole week, but for reasons which are apparent and which will be enlarged upon later on, this was found unsatisfactory and a daily card substituted. After several year's trial, the daily card has been pronounced a complete success.

The clock stamps the time of reporting for work and of quitting, in the spaces marked "In" and "Out." When the workman goes to work in the morning he finds a new card in the rack bearing his name, number and the date. He works it in the clock and places it back in the rack. When he goes out at the noon hour, the operation is repeated, likewise upon his return and upon leaving the yard in the evening, four operations in all.

After the day's work, the card is collected and turned over to the accounting department for entry upon the pay roll and for distribution. *Thus every day's time is distributed the following day.* We will treat of this point, though, a little more in detail later on.

So far as the time made is concerned, employer and workman both feel entirely satisfied that the record shown by the card is absolutely correct.

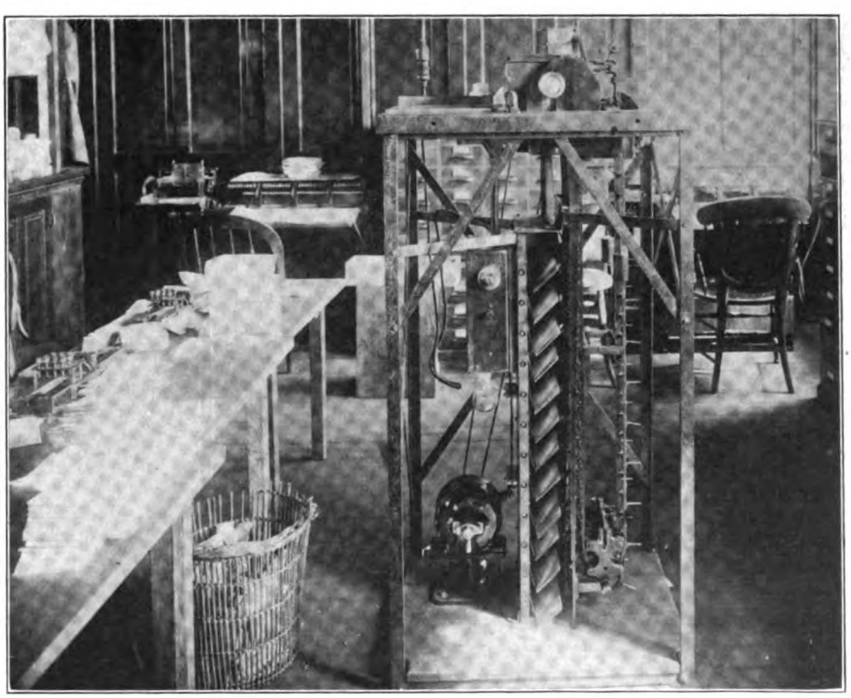
Before taking up the very interesting question of the distribution of the amounts on the cards, it may be well to tell something of the preparation of the pay rolls from data taken from the cards.



ELECTRICALLY-DRIVEN ARITHMETICAL MACHINE WHICH ADDS VALUES OF CARDS FED INTO IT

The paymaster has his pay roll sheets, Fig. 2, on which are *printed* the names of the men and their working numbers. This work is done by an ingenious little machine, run by an electric motor, using an endless chain, each link of which is detachable and bears the name and number of one man. The detachable feature provides for the dropping of a name if a man for any reason is no longer employed. The same chains used for printing the rolls are likewise used to print the names upon the pay envelopes. After the names have been written up on the rolls, the sheets serve for a week and as each day's cards come in, the hours are transcribed to the rolls, as well as the rate. It is therefore, at the end of the week, a very simple problem of arithmetic to arrive at the total earnings for each man. The whole operation, it will be observed, is upon data which the workman has himself kept and furnished.

This disposes of that part of the system having to do with the timekeeping and we may now properly take up its distribution. It is surprising, even in this age, the extent to which purely mechanical devices are being introduced into clerical



ELECTRICALLY DRIVEN CARD SORTER, SHOWING THE BINS IN THE FOREGROUND INTO WHICH CARDS ARE AUTOMATICALLY PLACED

MATERIAL CARDS

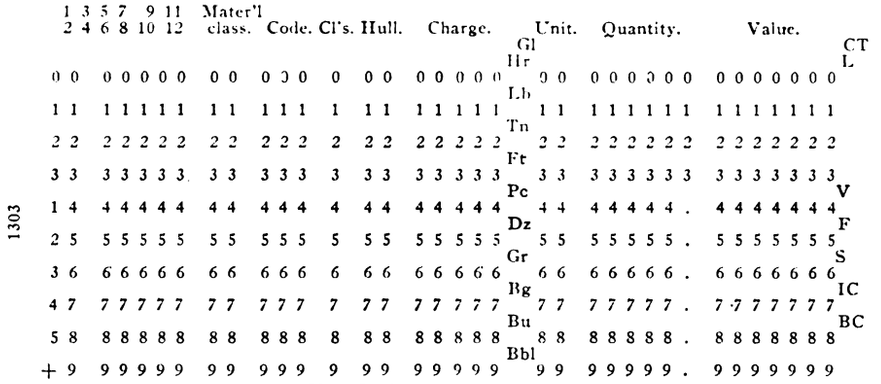


FIG. 3—BEFORE PUNCHING

MATERIAL CARDS

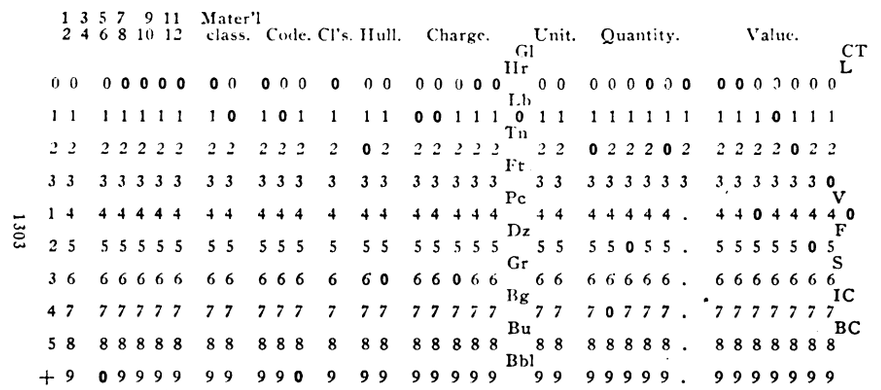


FIG. 3—AFTER PUNCHING

etc. The principle of the thing is simplicity itself. As stated before, the machine is electrically operated. The brush which passes over the face of the card comes in contact with the metallic roller back of the card, through the small hole. This forms an electrical contact and operates the slide for that particular bin. Hence all cards punched for the class to which the sorting machine is adjusted, will be thrown together. They may then be passed over to the adding machine and their total values determined.

The same method is employed for the distribution of material used. This card is red in color and is shown in Fig. 4. The data is punched out from information furnished by foremen and the store houses, and the sorting and adding machines perform the same functions for them as for the time cards.

To sum up, the system has unfailing accuracy of the actual time to which each men is entitled, no padded rolls is possible, and with the mechanical devices used, the distribution of the time and material is accomplished with great rapidity and carries with it the assurance that the human agency and its attending tendency to err is reduced to a minimum.

work. Arithmetical machines which will add, multiply, divide and subtract have been on the market for some years and reasonably familiar to all. But here we come to a machine, electrically driven, which will take several hundred or several thousand cards, and separate them automatically into whatever divisions the operator may elect. Standing alongside is another electrically operated machine which will take any given group of cards and by feeding them into it, will add their values with great rapidity and absolute accuracy. It is thus possible to distribute the time of 2,000 men within a few hours, whereas by the old methods it would require a half dozen clerks several days.

But a little more in detail. When the clock card shown in Fig. 1 comes into the accounting repartment, a girl will take the card shown in Fig. 3 and will transcribe the data on No. 1 to No. 3 by punching out the corresponding information. Card No. 3 then forms the basis of operation for the distribution. When all the cards are ready, or any part of them, for that matter, they may be sorted. The sorting machine can be adjusted to sort for any one of the several classes; man's number, operation number, class, hull, charge, machine,

MATERIAL CARDS

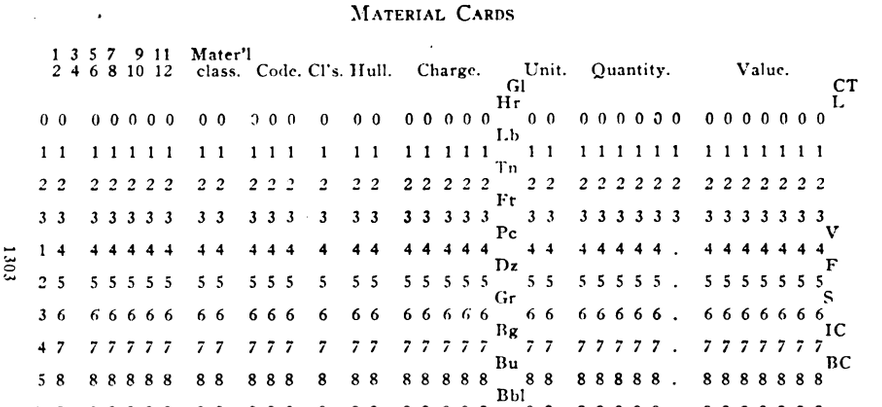


FIG. 4—BEFORE PUNCHING

MATERIAL CARDS

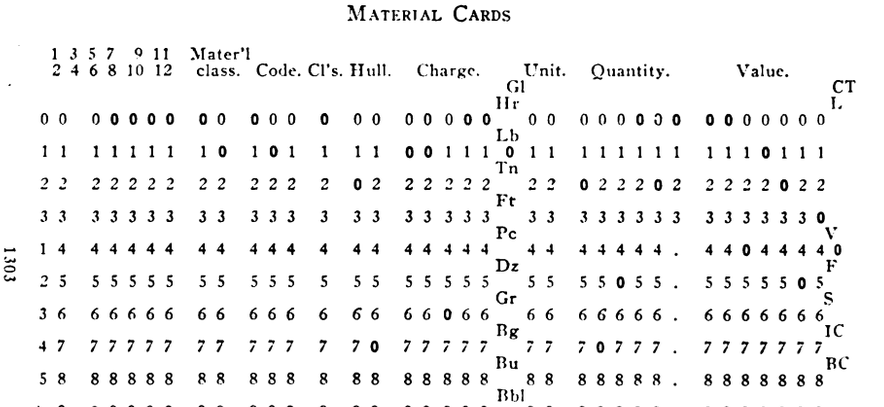


FIG. 4—AFTER PUNCHING

Bulk Freighter Wm. Livingstone opening The Livingstone Channel

THE Livingstone channel at the mouth of the Detroit river, was opened to commerce on Saturday, Oct. 19, with imposing ceremonies. The channel passes to the westward of Bois Blanc Island, making an independent waterway for downbound vessels and eliminating altogether the necessity of passing over the Limekiln crossing. The improvement has been long desired, as the Limekilns mark the most congested bit of waterway on the lakes, and an extremely dangerous place to navigation, owing to the restricted channel, rocky bottom and swift current. This channel was conceived by William Livingstone, president of the Lake Carriers' Association, who spent a great deal of time interesting the government engineers in the work and in prevailing upon congress to appropriate the necessary funds to construct it.

Work upon the channel was begun in the spring of 1908, and was concluded early in October of the present year. The channel altogether is about 11 miles long, though for a considerable part of its length little or no dredging was necessary. The important part of the work was the deepening of the channel abreast of Stony Island, where the natural depth of the river was only five or six ft. It was estimated that it would cost about 50 per cent less to dredge this portion of the channel in the dry and therefore the river was cofferdammed at that point. Work then proceeded without interruption for a period of four years.

The bulk freighter William Livingstone, owned by G. A. Tomlinson, of Duluth, was selected to open the channel under the pilotage of President Livingstone. Arrangements had been made to have all down-bound vessels that reached the St. Clair lightship by eight o'clock Saturday morning anchor until one o'clock, when the Livingstone, which was moored at the Brush street wharf in the Detroit river, would start down the river.

WILLIAM LIVINGSTONE

The flotilla of bulk freighters which had anchored near the St. Clair lightship under the general supervision of Capt. J. M. Johnston, shore superintendent of the Cleveland-Cliffs Iron Co., also began to make its appearance around the head of Belle Isle shortly after one o'clock, and the Livingstone then threw off her mooring lines and began her journey. She was followed immediately by the excursion steamer Britannia, carrying about 2,000 persons, and then came the fleet of bulk freighters and other available craft. The Livingstone's progress down the river was in the nature of a triumph. Everything that had steam up saluted her to the end that her own whistle was rarely silent. She entered the Livingstone channel at 3:15 p. m. and rounded the Bar Point lightship at 4:30, where President Livingstone was transferred to the Britannia, which had on board the members of the Detroit Board of Commerce. They were addressed by President Livingstone and responses were made by Homer Warren, president of the board of commerce; Mayor W. B. Thompson and Congressman McMorran. Those on board the Livingstone to do honor to the occasion were H. Coulby, president of the Pittsburgh Steamship Co.; J. H. Sheadle, secretary of the Cleveland-Cliffs Iron Co.; J. S. Ashley, of M. A. Hanna & Co.; Capt. John Mitchell, Capt. C. L. Hutchinson, S. P. Shane, A. R. Rumsey; C. B. Calder, general manager of the Toledo Ship Building Co.; R. B. Wallace, general manager of the American Ship Building Co.; Frank Jeffrey, general manager of the Detroit Ship Building Co., and a few invited guests.

The Lake Carriers Association ten-

EXCAVATED AREA OF THE LIVINGSTONE CHANNEL

dered a complimentary dinner to President Livingstone at Hotel Pontchartrain on Saturday night, at which J. H. Sheadle, vice president of the association, presided as toastmaster. In presenting Mr. Livingstone, he said that no man had done so much for the waterways of the great lakes. Mr. Livingstone in response said that when he first became associated with lake trade, 97 per cent of the tonnage was sail and 3 per cent steam. Today 96 per cent is steam and 4 per cent sail, including as sail the barges which are towed. He referred to the well-known fact that the Poe lock, though adequate for a great many years, was practically inadequate before it was completed, so rapid has been the expansion of commerce.

Mr. Coulby said that his life had been devoted to water transportation, and that it is a science upon which the welfare of the whole people depends. If barriers are removed it is not for the benefit of the vessel owner or the farmer, but for humanity in general. He did not number himself among those who look back with longing at $2.00 freights. That period belongs to the past. The benefit of deeper channels is only momentary to the ship. It takes away the barrier between producer and consumer, and the consumer gets the benefit. Ten years ago the straight cut at the mouth of the Detroit river was a dream; today it is a reality and an eternal monument to the man who conceived it.

Col. C. McD. Townsend said that the 80,000,000 tons of freight which annually pass through the Detroit river justifies the great expense of the Livingstone channel. He referred to the fact that it costs 4 cents per ton mile to move freight on the Mississippi between St. Louis and Cairo, whereas on the great lakes it is moved for eight-tenths of a cent per ton mile.

Col. Patrick, government engineer with headquarters at Detroit, said that the saving of one cent a ton on the commerce passing through the Detroit river would pay for the Livingstone channel in ten years.

Addresses were also made by Geo. H. Russel, George H. Barbour, Homer Warren, G. A. Tomlinson, Chief Justice Joseph P. Moore, of Michigan, and Capt. D. Sullivan. Especially interesting were the remarks of Capt. D. Sullivan, who contrasted early conditions on the lakes with present practice. Owing to the historical importance of his remarks, they are incorporated herewith:

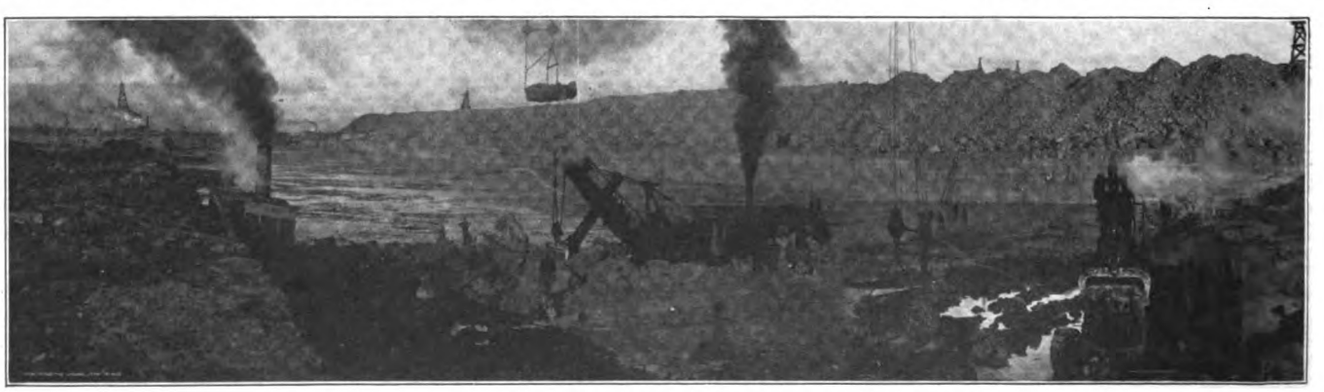
Remarks of Capt. D. Sullivan

"Mr. Livingstone and his associates in the Lake Carriers' Association with assistance in the way of liberal appropriations from the federal government, and the most earnest and hearty support of that grand body of men, the government engineers, have made history in improving lake channels the past ten years that will stand for all time.

"Mr. Sheadle informed me that I am expected to take the place of ox tail soup on his card, that is, I am expected to go back a long way in lake affairs. I don't know why he did not call upon Capt. John Mitchell or some of the older sailors present, unless he wanted to show me up because my good wife is present. However, I will start in, simply noting a few of the changes in lake marine since 1863. In that year, I sailed in a ship of 160 tons capacity in the coal trade between Erie and Buffalo. She was owned and sailed by a gentleman who now resides in Michigan, and is recognized as one of her wealthy citizens.

"We had plenty of good food, also plenty of fresh air and exercise. I don't recall now what wages were promised us. I don't think that made much difference. There wasn't much money in circulation then. If there was, it didn't reach us; however, we were happy and satisfied for we realized that we were receiving a good practical education, not only in seamanship, but also in economy.

"In looking back it seems to me



LIVINGSTONE CHANNEL, SHOWING THE WALL-LIKE CONSTRUCTION

that with the passing of the sailing ship on the lakes, the romance and the greater part of the sentiment passed with them. In recalling the names of some of the handsomest vessels that ever floated in any waters there were the Coquette, Wend the Wave, Wings of the Morning, Starlight, Sunrise, Morning Light, Moonlight, Sunnyside, Sweetheart.

"The ships of today are named for men who do things. That's why that monster that headed the procession today was named the William Livingstone. It's a fitting name for her. Nobody would think of naming her sweetheart. It would be very appropriate for the man,—but not the ship.

"Another marked change is the sinking of the personality of the old-time master. The vessel he sailed was seldom referred to by his associates or men directly connected with marine affairs. If you asked the mate on relieving him what vessels he met during his watch he would answer John Lowe, Jim Brown, Jack Shaw, Johnnie Coulter, George McLeod, Jimmie Rardon, Jerry Coleman, as the case might be.

"There is one body of men who figured largely in the lake trade that I take off my hat to, and those were the men who were masters of the finest tugs that ever turned a wheel in the sixties and seventies. Their skill in navigating the rivers and unmarked channels with a string of vessels, was simply marvelous, and was only surpassed by the skill displayed by the gentlemen who organized the Detroit River Towing Association in separating the unfortunate vessel man from his money.

"I would very much like to have a copy of their tariff of 1872. I think they must have had the assistance of a plumber in getting it up. The distance from Lake Erie to the flats is about 50 miles. The tariff stated that if a vessel sailed from Lake Erie up to that point that she would be towed the other 30 miles at the full tariff rate from Lake Erie to Lake Huron, and the same if a vessel sailed down from Lake Huron to the flats.

"Grassy Island and Mamajuda were the only aids to navigate between Bobolo and Wind Mill Point.

Beginning of Private Lights

"In 1873 some enterprising gentleman placed a float on Ballard's reef which displayed a red light that could be seen under favorable weather conditions about 500 ft. Collections were taken from the vessels. As this showed a good profit, several enterprising citizens hung up a lamp at intervals all the way up to Fort Gratiot and the good work of collecting went on until Mr. Livingstone prevailed on the government to forbid the use of private lights.

As late as 1880 there was no official gage at the Lime Kiln Crossing. Duff & Gatfield displayed a red flag from a pole on the dock when the water looked low. On making inquiry about the probable depth you were told that Johnnie Coulter struck going over yesterday, or George McLeod struck this afternoon, but not quite so hard, and there you were. If you wanted to take a chance, there was always a small tug to assist you in making the attempt.

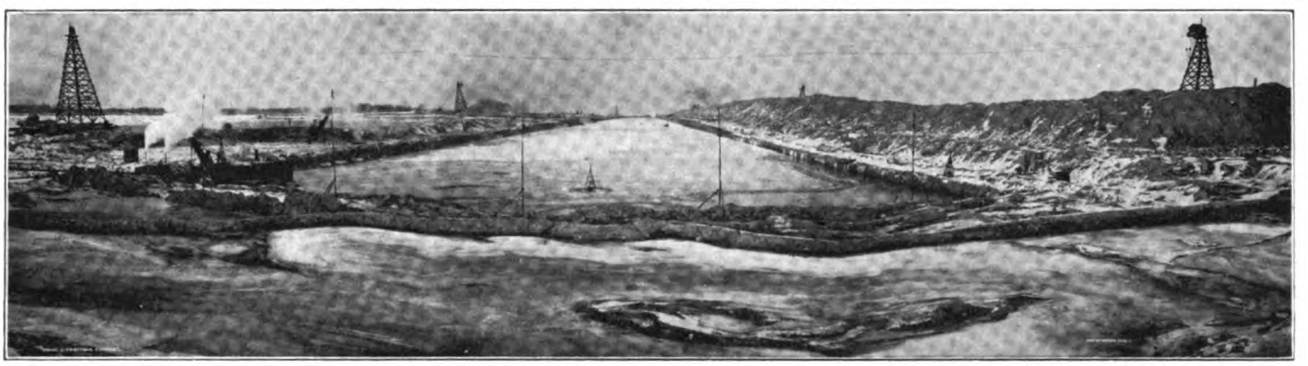
Coming of the Steel Ship

"Detroit was the one point on the voyage in the sixties and early seventies that no vessel could get by without making a call at the marine post office, located at Trowbridge & Wilcox's store. Anything in the way of ship supplies from a needle to an anchor could be obtained there, and a tow stopping at Detroit at six in the evening seldom got away until six in the morning. This was all changed by the advent of the large sailing fleet in the early seventies, the masters as a rule making a contract with the tug to go through without stopping unnecessarily, which could be done, as coal was rapidly displacing wood.

"The next decade brought the steel ship, and the passing of the white wings was rapid. Beautiful, neat, trim sailing vessels were degraded into tow barges. It almost broke my heart to suddenly come on to what was once a fine ship in the harbor of Cleveland one day in 1890. I commanded her for 12 years, and they were 12 of the happiest years of my life. O! what a change; her foremast was leaning to port, her main mast was starboard, and her mizzen mast head gone at the trustle trees. She was loaded all right; she had about two inches of free board amidship.

"Good old days. We frequently hear of the good old days. That is a mistaken idea. If there were 'good old days' it was only for some boy whose father was in a position to send to college. There was no 'good old days' for the sailor boy. The crews as a rule handled the cargo at one end of the trip and lumber and other coarse freight were loaded off shore, or from lake shore piers. The hours were continuous in some instances, and 17 or 18 working hours in most all cases in loading ports.

"The crew's quarters in the handsomest vessels were dungeons in comparison with the quarters on the modern steel ship. Everything in the so-called 'good old days' on board ship was done by main strength and hand labor. The watch below was subject to call at any minute to take in or shorten sail. The watches were then four hours. The watches now are six hours, and the watch below are never called except to get up and eat. The men themselves on the modern ship know that the present are the good days, and that they are the best fed and best housed and best paid men that ever followed their line of work in any waters, and with the best opportunity for promotion if they make good."



LIVINGSTONE CHANNEL, ADMITTING WATER INTO THE PART THAT WAS EXCAVATED IN THE DRY

The New Buffalo Steamer "See-and-Bee"

THE new side-wheel passenger steamer building for the Cleveland & Buffalo Transit Co., Cleveland, was launched on Nov. 9 from the Wyandotte yard of the Detroit Ship Building Co., and was christened See-and-Bee by Miss Eleanor Moodey, daughter of Robert C. Moodey, of Painesville, a director of the company, thousands witnessing the event. The new steamer is not only the largest sidewheel passenger steamer on the great lakes, but is also the largest sidewheeler in the world, and it is not likely that a steamer of her type exceeding her dimensions will ever be built. Naval architects are quite agreed that she is the last word for this class of craft. Frank E. Kirby is reported to have said that he will never design a bigger sidewheeler.

The steamer is of the following dimensions:

Length over all	500 ft.
Length between perpendiculars	485 ft.
Beam of hull, moulded	58 ft.
Extreme beam over guards	97 ft. 8 in.
Depth of hull at stem	30 ft. 4 in.
Depth of hull at stern	27 ft. 1 in.
Depth of hull, moulded	23 ft. 6 in.
Depth of hull at guards	22 ft. 10 in.

Her guaranteed speed is 22 miles an hour from dock to dock.

There are 62 staterooms fitted with private toilet connections, 408 regulation staterooms, and 24 parlors en suite with private bath and toilet, making a total of 494 rooms.

Structure of the Hull.

The hull is constructed entirely of steel, having a double bottom for water ballast extending for a length of about 365 ft., and having a depth of 3 ft. above the base line. This double bottom is divided at the center line by a fore and aft watertight girder, and is further subdivided by transverse bulkheads into 14 separate watertight compartments. The hull above the water bottom is divided by 11 athwartship watertight bulkheads extending from the keel to the main deck. These watertight bulkheads, with the exception of the collision bulkhead and other bulkheads that are required by law to be without openings, are fitted with watertight doors operated hydraulically from the engine room.

Including the tank top, there are seven decks in all, namely, the orlop deck, main deck, promenade deck, galley deck, upper deck and dome deck.

Steel is used to a greater extent in the structure of this ship than in any other of her type, being carried to the promenade deck. The housings on orlop and main decks and top sides to promenade deck are of steel. The top sides of promenade deck are finished with channel gutter, forming a landing for the promenade deck beams, which are of wood. The beams and under side of promenade deck, however, are sheathed with galvanized iron with heavy asbestos paper between the iron and wood. This, with the steel housings up to the promenade deck, makes the vessel practically fireproof. Moreover, the engine room, boiler room and galley, ventilators and inclosures are all of steel and extend from the main deck through the top of the dome. Fireproof doors are also fitted, extending from the main deck through all decks to the dome, dividing the vessel into three separate compartments. In fact, particular attention has been paid in the designing and construction of the vessel to fire protection and appliances for fire fighting.

In addition to the three great divisions, the boat is divided into 50 sections for fire alarm purposes, each section containing about eight staterooms, and by means of a very ingenious device of hollow wire with which each stateroom is equipped, any disturbance will be immediately registered upon an annunciator located in the engine room and in the captain's quarters. The risk of a serious fire aboard has been reduced to a minimum through precautionary measures. For instance, the crew's quarters are built of steel throughout, the cargo spaces are insulated with galvanized iron and asbestos wherever wood is used. Steel fire curtains are fitted in cargo spaces opposite engine room inclosures. Fire hydrants are located throughout the vessel, so spaced that 50-ft. length of hose connected at all times reaches every part of the vessel.

There is also a very complete automatic sprinkler system throughout the interior of the ship, covering all cargo holds, crew's spaces, hallways and cabins, smoking room, lounge room, and other service rooms of the ship. This system is controlled automatically by a special sprinkler pump located in the engine room. When the vessel is docked connections are also made whereby city protection for fire purposes can be immediately used.

There are two trimming tanks, each of about 52 tons capacity, located on

both port and starboard sides just aft of the wheel casings. These tanks can be either filled or emptied in from two to four minutes, thus making it possible to keep the vessel always on an even keel.

Bow Rudder

To facilitate quick handling in rivers and harbors, the steamer is fitted with a bow rudder, which is controlled by a steam steering engine located on the main deck forward and directly connected to rudder stock by chain and quadrant. The character of the service is such that the vessel has to navigate restricted in somewhat tortuous channels at both Buffalo and Cleveland, and the bow rudder makes her instantly responsive and manageable. The after rudder is controlled by a steam steering engine connected to quadrant by a chain. The Akers emergency steam steering gear is also provided should anything go wrong at any time with the after rudder.

The vessel is fitted with two stockless anchors of 6,500 lbs. each, with 185 fathoms of 2¼ in. steel chain cable. Anchors are stowed on sloping anchor beds forward, connected and operated by a 10 by 10 speed geared windlass.

The life saving appliances of the vessel will be in accordance with government requirements, there being 18 metallic lifeboats, all of special design, 14 of these having capacity for 40 persons each, two having capacity for 20 persons each, and two for 16 persons each. In addition, the vessel is equipped with the usual number of life rafts and life preservers as required by the United States steamboat inspection service.

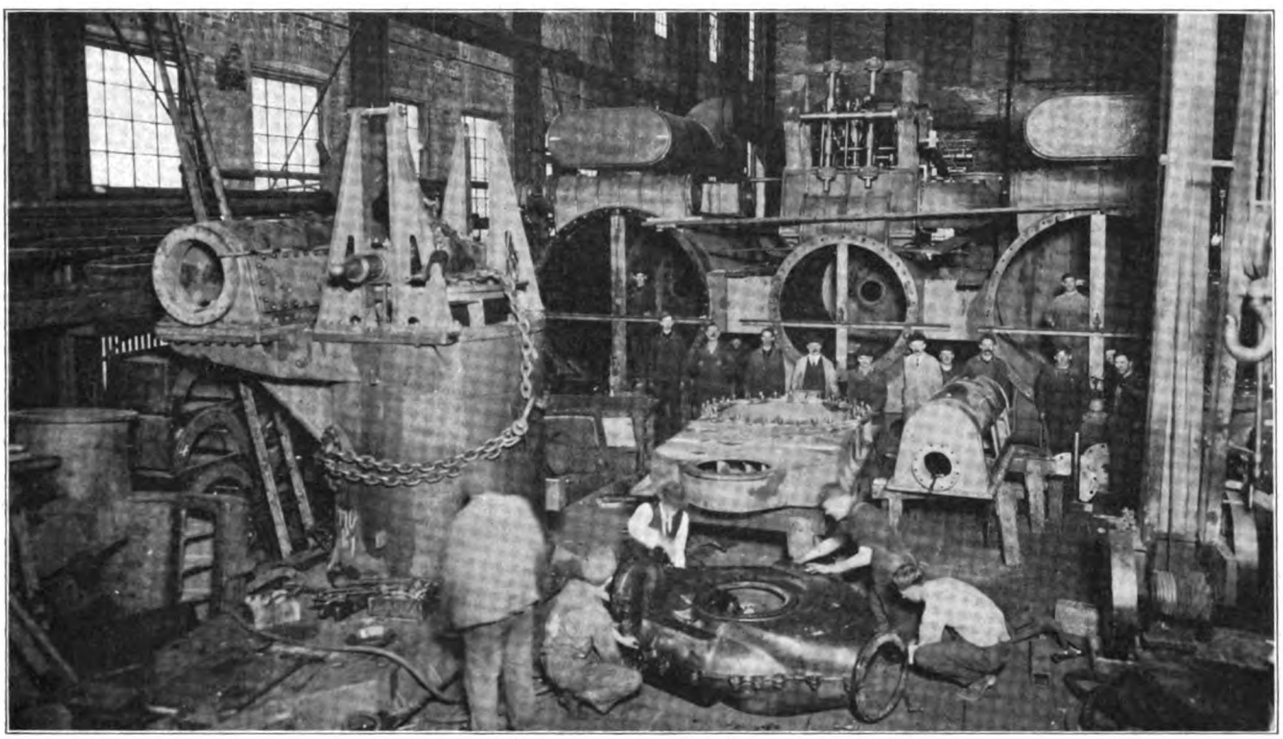
The second-class cabins, both for men and women, are built entirely of steel and are located on the main deck forward of the lobby.

Ventilation of the Ship

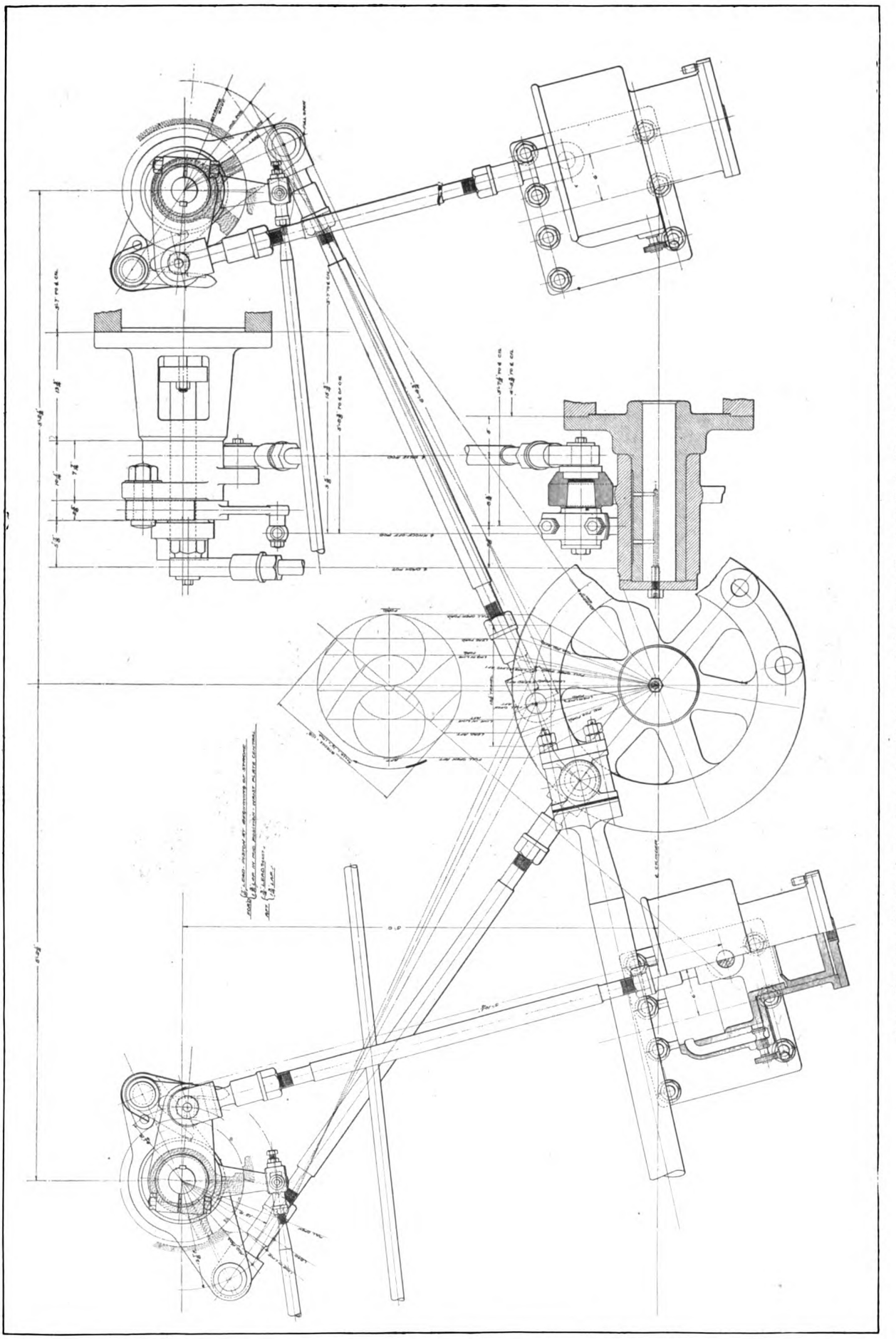
Great attention has been paid to the ventilation of the ship, which is equipped with the latest type of McCreery Engineering Co.'s washed air system of ventilation, reaching all inside staterooms, dining room, buffet, smokeroom, galley and crew's spaces. This system of ventilation is also directly connected to all lavatories and toilet rooms throughout the ship, and is divided into five units, as follows: One unit forward in the hold will supply the crew's quarters for that end of the ship; one unit in the hold directly aft of the engine room will supply the crew's quarters aft and the galley; one unit located on the orlop deck aft will supply the dining room, and two units on the main deck, port and starboard, will supply all the inside staterooms, the baggage room, the telephone room and second class deck cabins.

These units consist of a McCreery air washer, built of heavy sheet copper with brass angle and brass pipe work. A Sirocco fan direct connected to an electric motor draws the air through a washer and distributes it through the duct work. The spray in the washer is maintained by a centrifugal pump direct connected to an electric motor. Throughout the crew's quarters and galley adjustable elbows are used for distributing the air, making it possible to deliver the air in any desired direction. The air in the staterooms is introduced underneath the lower berths in such a manner and in such velocity that no draft is felt in any part of the room. The lower berth is kept out from the wall at least an inch so that the air flows directly upwards entirely around both berths. A space between two carlins is closed off and is provided with a hinged door at both the side wall of the inside staterooms and the outside of the cabins. This provides a natural exhaust to the rooms to the outside of the ship.

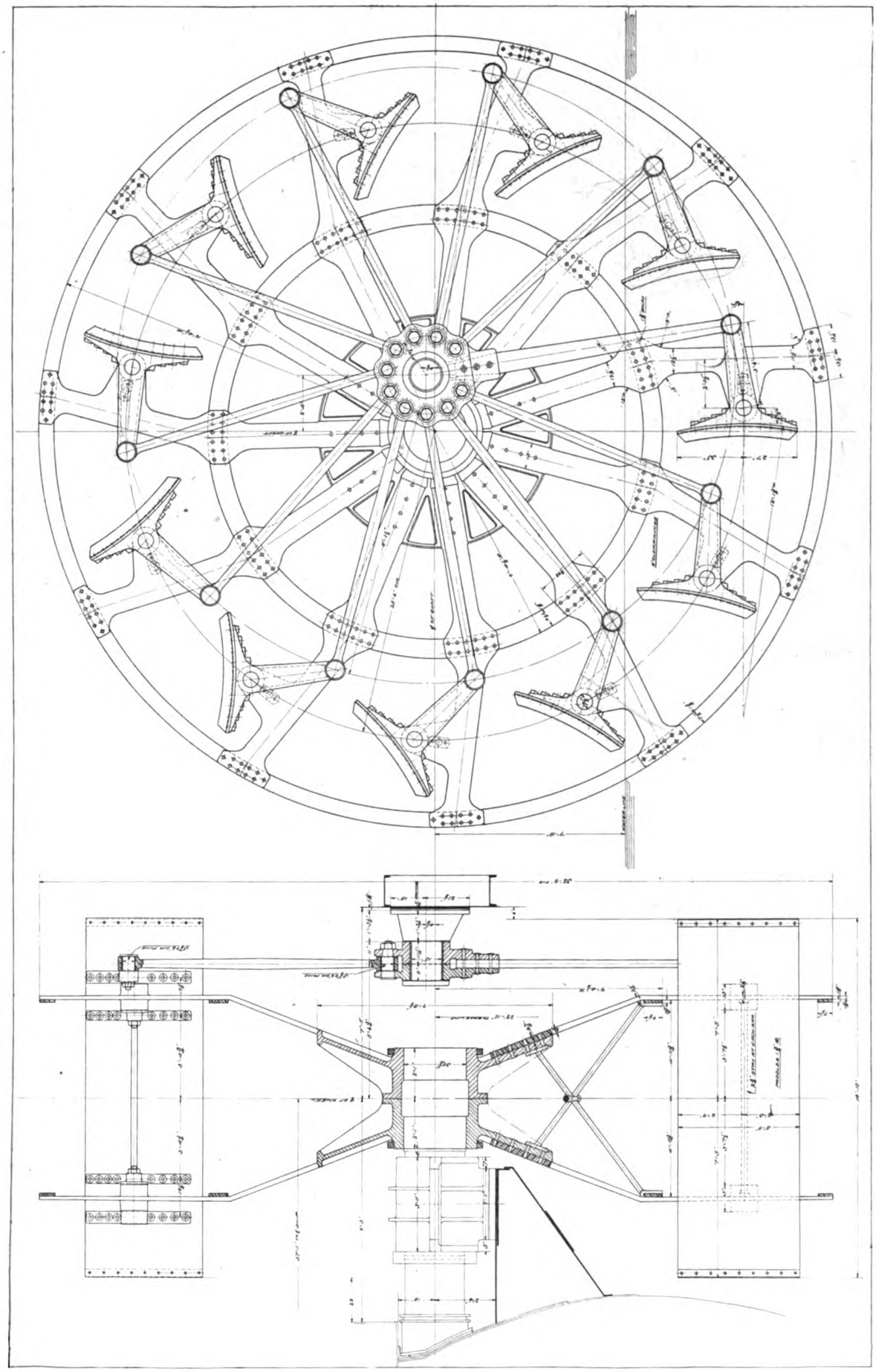
The heat generated in the galley and the foul air from the crew's quarters aft are removed by a large Sirocco fan located in the galley vent and connected to the spaces to be ventilated by means of duct work. Approximately 60 H. P. electric current is used for the ventilating system. The local vents from all the toilet fixtures throughout the ship are connected by means of duct work with aspirating tubes in two of the stacks, thus maintaining a positive exhaust of considerable suction on all



MAIN ENGINE OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE IN THE MACHINE SHOP OF THE DETROIT SHIP BUILDING CO.



LOW PRESSURE VALVE SETTING OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE



ARRANGEMENT OF PADDLE WHEELS OF CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

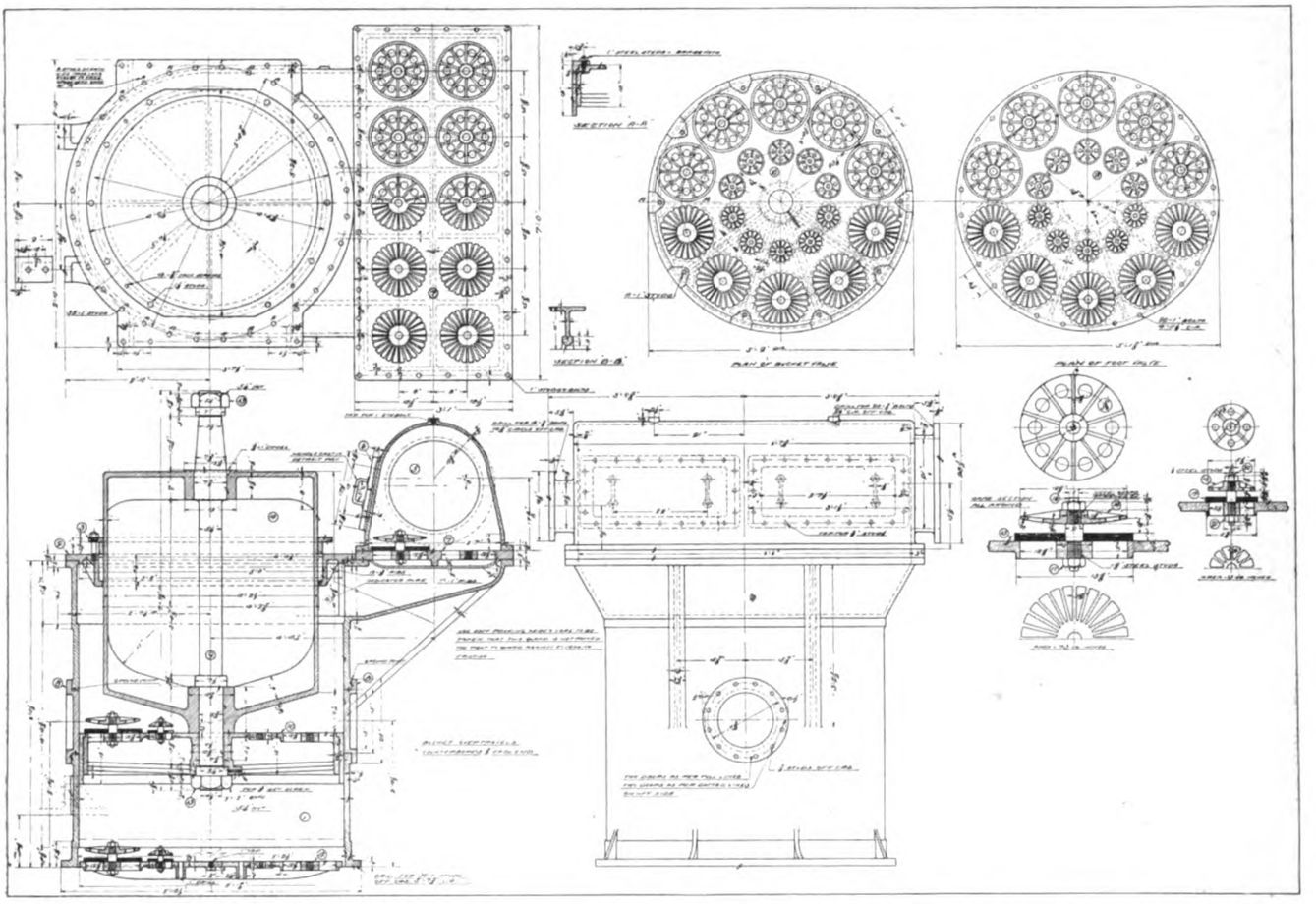


DIAGRAM OF AIR PUMPS OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

these fixtures so that no possible odors escape into the ship. This is a very important feature, as a large number of toilet fixtures are installed with parlors and semi-parlors.

For warping the vessel at dock there are fitted on the main deck six 8 by 10 special mooring engines.

The steamer is also fitted with an Akers emergency steam steerer, which can be thrown into service in four seconds should the regular give out.

The Power Plant

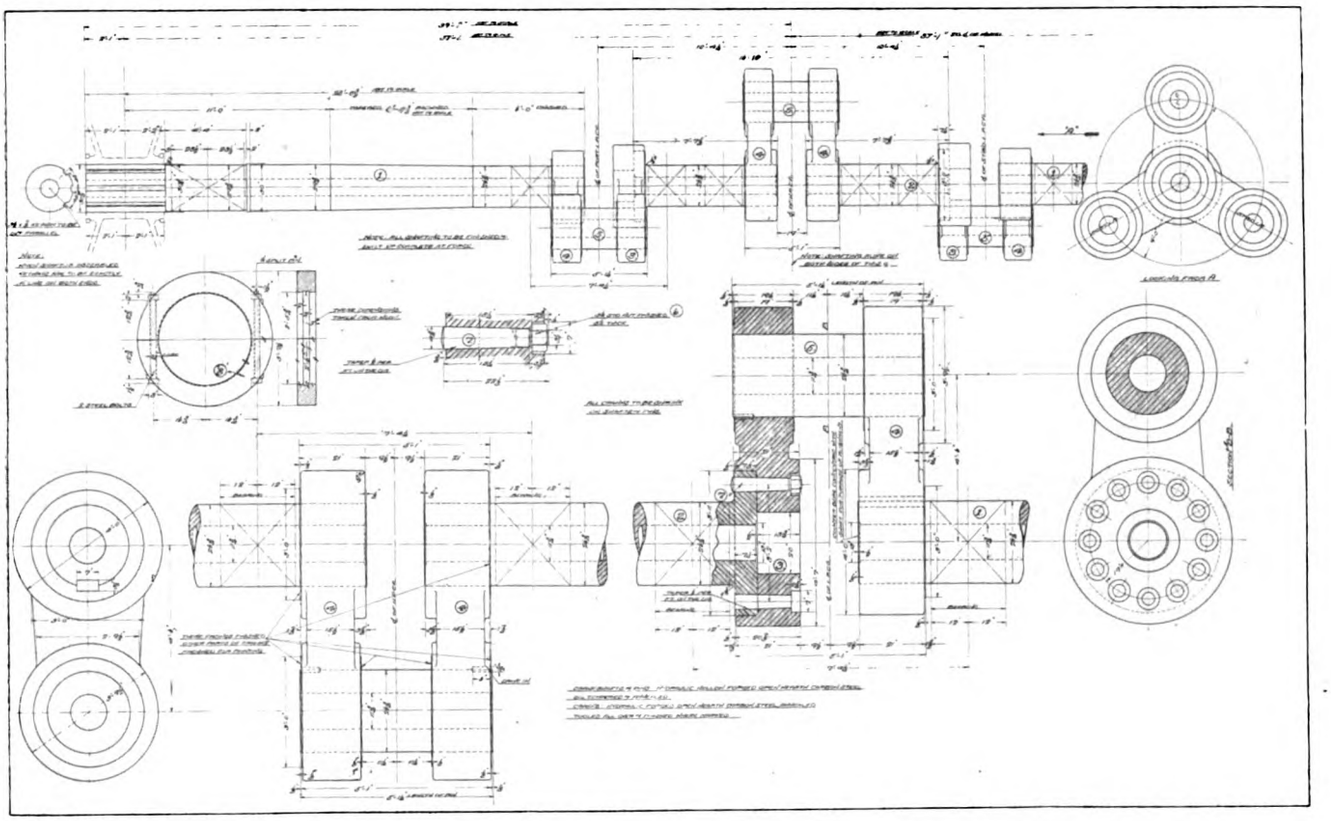
The power plant of this steamer is in proportion to the size of the steamer itself, and hence is no small affair, being designed for the development of 12,000 H. P. There are nine boilers in the steam plant, all of the Scotch type. Six of them are of the ordinary single end construction, 14 ft. diameter, 10 ft. 11¼ in. long, and three of the double end type, 14 ft. diameter, 21 ft. 10½ in. long; all built for 165 lbs. working pressure. The single end boilers are peculiar in that their shells are made up of but a single sheet as to length, there being no circumferential seam, as is usual. The double end boilers are necessarily made with two sheets, but have only one circumferential seam in place of the usual two. There are twenty-four 54-in. Morrison corrugated furnaces, two in each of the single end boilers and four in each of the double end boilers. The total grate surface in these boilers is 590 sq. ft., and the heating surface is about 27,600 sq. ft. The grate bars are all 5 ft. 6 in. long.

The boilers are installed in three compartments with athwartship coal bunkers between, thus forming four fire holds. The bunkers are so placed that the coal is practically self-trimming onto the fire floors, thus necessitating but little coal passing. There are four smoke stacks, all jacketed to the top of the dome and protected from the cabin by steel casings insulated with cell board.

A complete system of Howden draft is fitted to the boilers, air being supplied by four No. 9 Sirocco blowers of 37,500 cu. ft. capacity each, and each driven by American Blower Co. 7 x 7 engines, double enclosed, direct-connected. By a suitable arrangement of dampers and cross ducts, any blower can be made to supply air to any boiler, so in case of one or more blowers being disabled, the system will not be completely out of commission. Fire hold floors are all of ribbed steel plate, supported on angle iron frames. Two hydraulic ash guns are installed in each fire hold, and two 40-in. diameter ventilators in each hold serve to bring fresh air down from outside. The tops of the ventilators can be turned from down below so the firemen can arrange their ventilation to suit their requirements.

The Main Engine

The main engine is installed in a compartment by itself immediately aft of the boilers. Practically the entire engine is under the main deck, only the tops of the main bearings, the upper part of some of the valve gear and the handling levers, projecting above the level of the deck. The engine is of the three-cylinder, compound, inclined type with one high pressure cylinder 66 in. diameter and two low pressure each 96 in. diameter, all with a stroke of 108 in. The cylinders are located aft of the shaft, the high pressure in the center with the low pressures on either side. They are beautiful specimens of the founders' art, being practically without flaw and are further remarkable in that they are the largest engine cylinders ever cast in



DETAIL OF CRANK AND WHEEL SHAFTS OF THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

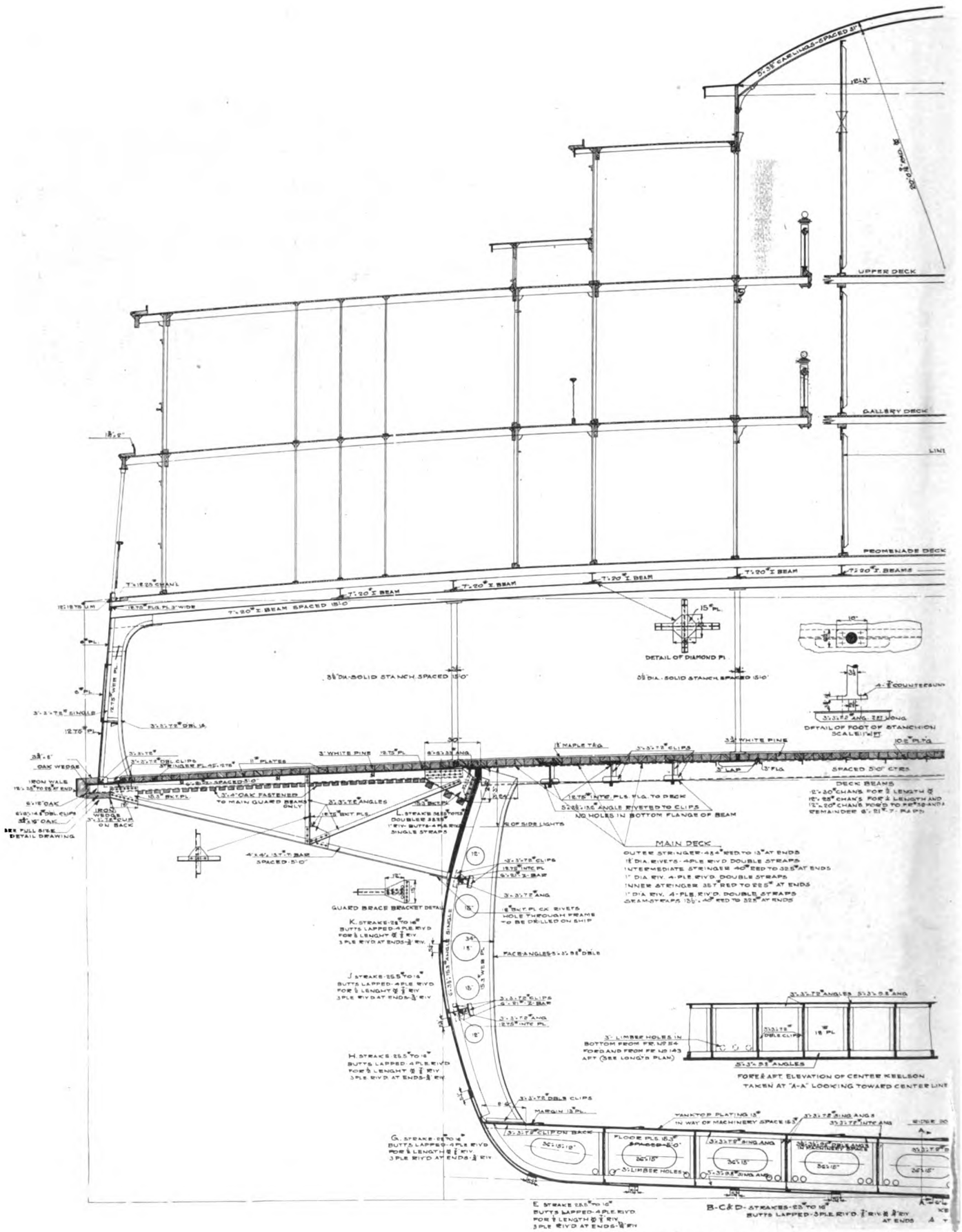
the lake region. The low pressure cylinders are about 13 ft. long and 13 ft. high over the steam chests. All the cylinders were molded on ends in loam molds. The open end was cast down, this being the usual practice of the makers. The mold was parted on the center line of the steam chests, also in the center line of the cylinder and drawbacks were made on the upper steam chests. These partings were made to enable setting of the cores with greater accuracy. The radial cores for the crank end of the cylinders were suspended from the top plate of the mold, and the center of main core, was put in place last. The contract called for 30,000 lbs. tensile strength, but all test bars showed better than the requirements. The rough casting of one low pressure cylinder weighs 65,760 lbs., the other 67,200 lbs. The high pressure weighed 54,000 lbs.

Heavy Forgings

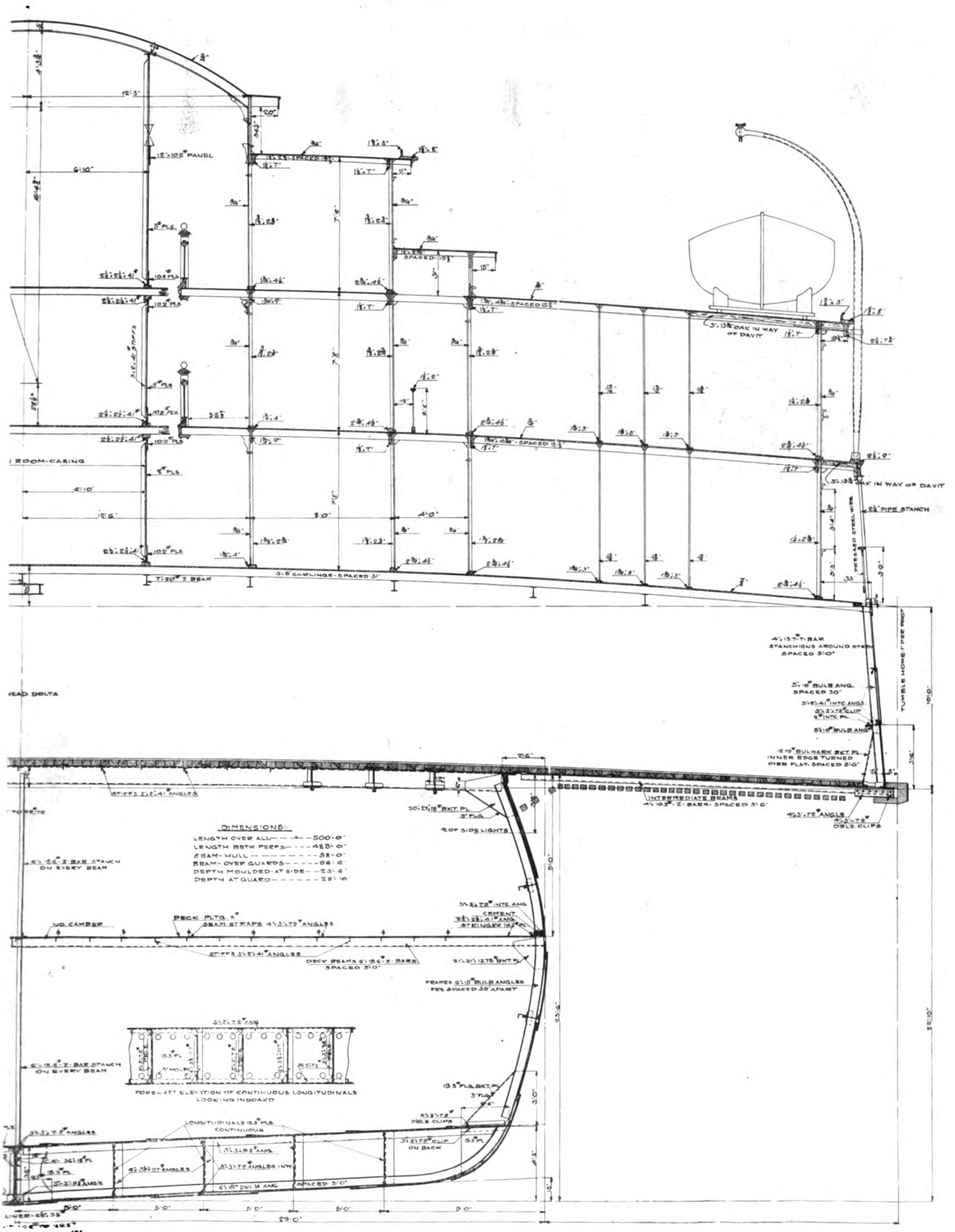
The main shaft is of open-hearth steel, hydraulic hollow forged. It is 26¾ in. diameter in the main journals, 29¾ in. diameter in the outboard bearings, is 78 ft. 6 in. long and has an 11¾ in. hole throughout the entire length. The shaft weighs 120 tons. It is made in three sections. The high pressure crank and the adjoining pieces of shaft form the center section, while the two wheel shafts with the low pressure cranks attached form the two side sections. The sections are bolted together with flange couplings which are counterbored into the inboard low pressure cranks and bolted with tapered bolts. These forgings are the largest that the Midvale Steel Co. has ever turned out.

The main journals are massive steel castings with flanged bases bolted directly to the structure of the ship, which is at this point made exceedingly heavy and strong. The bearings are steel shells lined with best babbitt metal, the upper half being hollow and having cold water circulated therein. The outboard bearings, next to the paddle wheels, are also of cast steel with babbitt-lined shells. They are made adjustable in fore and aft direction by means of wedges and vertically by jack screws and shims. The crosshead slides are open-hearth steel forgings, attached to the main journals by two very large bolts passing through a "T" end on the slides. The cylinder ends of the slides have circular flanges by means of which they are attached to the cylinder with six bolts each. About the middle of the length of the slide, a substantial stanchion is placed with its lower end resting on the engine foundation girders. The connecting rods are of open-hearth nickel steel, highly finished. The crank end is bored out and sawed apart to receive the babbitt-lined brasses of the crank pin bearings. The cap is attached to the rod by two substantial nickel steel bolts. The crosshead end is forked and has flat back brasses attached with steel binders and bolts. The rods are 21 ft. 2 in. long, center to center, and weigh about 11½ tons finished. The piston rods are also of nickel steel, 12½ in. diameter and are attached to crosshead and pistons with taper and nut. The crosshead bodies are nickel steel forgings with babbitt-lined cast steel jaws bolted on. Pistons are of cast steel, conical, single thickness body with cast iron bull ring and packing rings; two packing rings each piston are double, each being made up of a square section ring laid in bosom of angle section ring, both rings being cut into lengths of about 18 in., joints broken and the whole set out against cylinder walls by light flat springs.

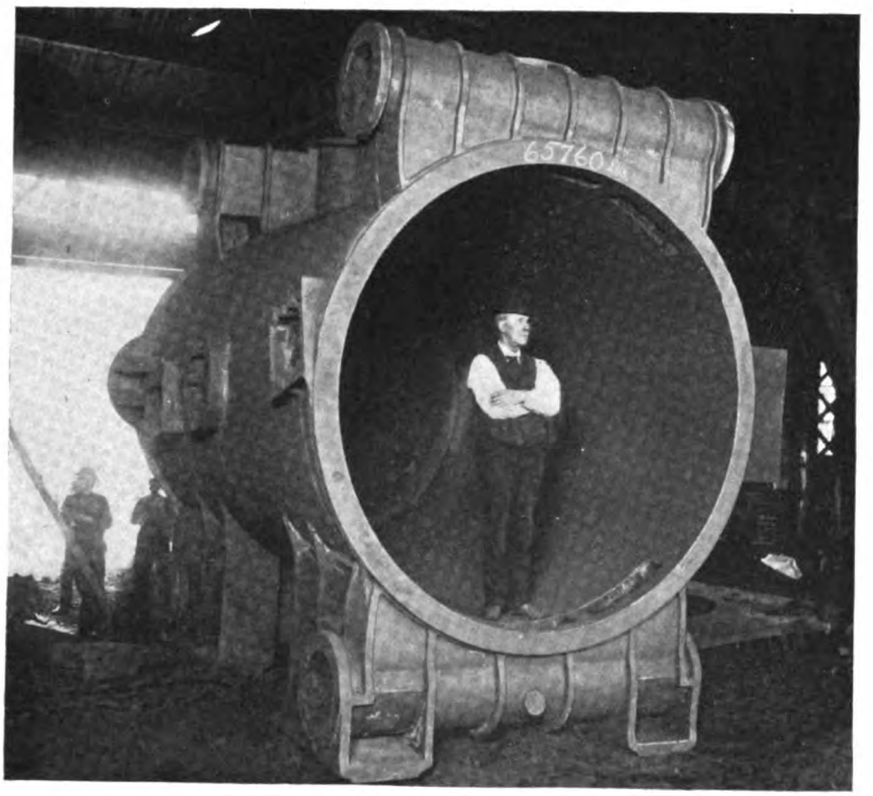
There are two air pumps and two condensers; one for each low pressure cylinder located under the low pressure crosshead slide with the buckets driven by forged steel rock arms from the low pressure crossheads. The pumps are 62 in. bore



Midship Section of the Cleveland & Buffalo



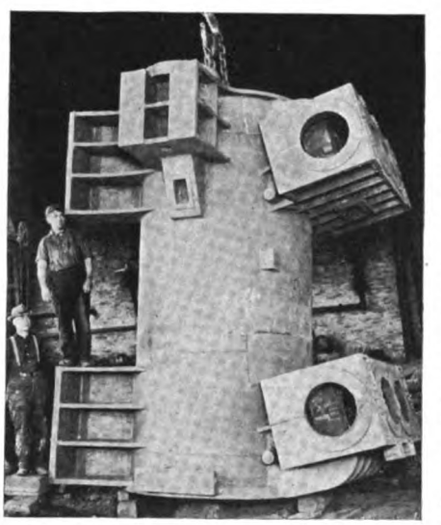
TRANSIT CO.'S NEW STEAMER SEE-AND-BEE



LOW PRESSURE CYLINDER, STEAMER SEE-AND-BEE

and 41½ in. stroke. A bilge pump and a direct connected feed pump are both driven off each air pump crosshead. The condensers are built up of riveted plate and each low pressure cylinder connects with its own condenser through a 24-in. exhaust pipe.

The high pressure cylinder is equipped with poppet steam and exhaust valves, and the low pressure cylinders have Corliss valves. The driving mechanism for all these valves is an innovation in marine work, in that the Walschaert valve gear, so familiar on locomotives, is applied for wrist plate drive on the low pressure cylinders and for the poppet gear on the high pressure cylinder. The principal reason for adopting this gear was the desirability of one eccentric on the main shaft for each cylinder and the advantage of short eccentric rods; also that the links take up less head room. Cut off in the high pressure cylinder is adjustable by means of Sickles cut-off gear with a range from ¼ to ¾ stroke. The regulating stands for the cut-off gear are located on the handling platform close by the other control levers, so the engineer on watch can readily make any adjustment he desires without leaving his station. The reversing mechanism of the engine is operated by a large steam cylinder controlled by the usual hand lever. An auxiliary reversing gear consisting of worm and worm wheel, is fitted for hand use at such times as the steam gear may be out of commission. The main throttle valve, 18 in. in diameter, is of the Schuette-Koerting balanced type and is controlled by a direct



HIGH-PRESSURE CYLINDER, STEAMER SEE-AND-BEE

hand lever and is fitted with a 7-in. auxiliary or maneuvering valve. There is also a 7-in. passover valve fitted, which admits steam directly to the low pressure cylinders in case the high pressure crank happens to be on center. The lubricating system is elaborate and complete as are the appliances to assist in the overhauling or lifting of the engine parts.

The two paddle wheels are 30 ft. in diameter over the outer edge of the buckets, and 32 ft. 9 in. in diamter over the rims. They are of very massive construction, having hubs of cast steel and arms of wrought iron forgings, with the trunnion hubs forged on the arm. There are eleven buckets in each wheel, 14 ft. 10 in. long, 5 ft. 1 in. wide, of 1⅜ in. thick steel plate. The bucket brackets are all of cast steel with forged steel trunnion pins. Heavy forged radius rods with cast steel eccentrics and bearings, form the feathering mechanism which is carried on substantial steel spring beam outside the wheels. The finished wheels will weigh about 100 tons each and are designed to cope with the severe ice conditions met with on the Buffalo run in the early spring.

Electrical Equipment

The electrical equipment of the new steamer will be unsurpassed. Altogether there will be 4,500 lights aboard the ship. Practically every function that can be electrically performed will be so performed. The generating sets consist of three 75 kilowatt Kerr turbine-driven Northern generators, direct-connected to dynamos and, along with the main switch board, located in the engine room on the main deck. The boat will be wired throughout with the new National Board of Underwriters marine core wire, and the conduits for carrying the wire will be of galvaduct. The main switch board will be equipped with automatic circuit breakers and also double throw switches so that all power can be put on any dynamo should it be necessary. All fuses in switch board and distributing boards will be of 250-volt National Code type. The circuits are so arranged that the electrician can disconnect any number and combination of lights, still leaving light enough to get around. This is convenient, of course, for the night lighting of the ship when fewer lights are required.

The telephone system is in full equipment exactly similar to a system in vogue in cities, having motor generator for calling and a central storage battery for talking. There are over 500 telephones on the boat, one in every stateroom, as well as in the officers' quarters and in the telephone booths, with the main switch board in the social hall. It is, therefore, possible for the traveler to have communication with the officers of the ship with which he has direct dealing, such as the purser and the steward,

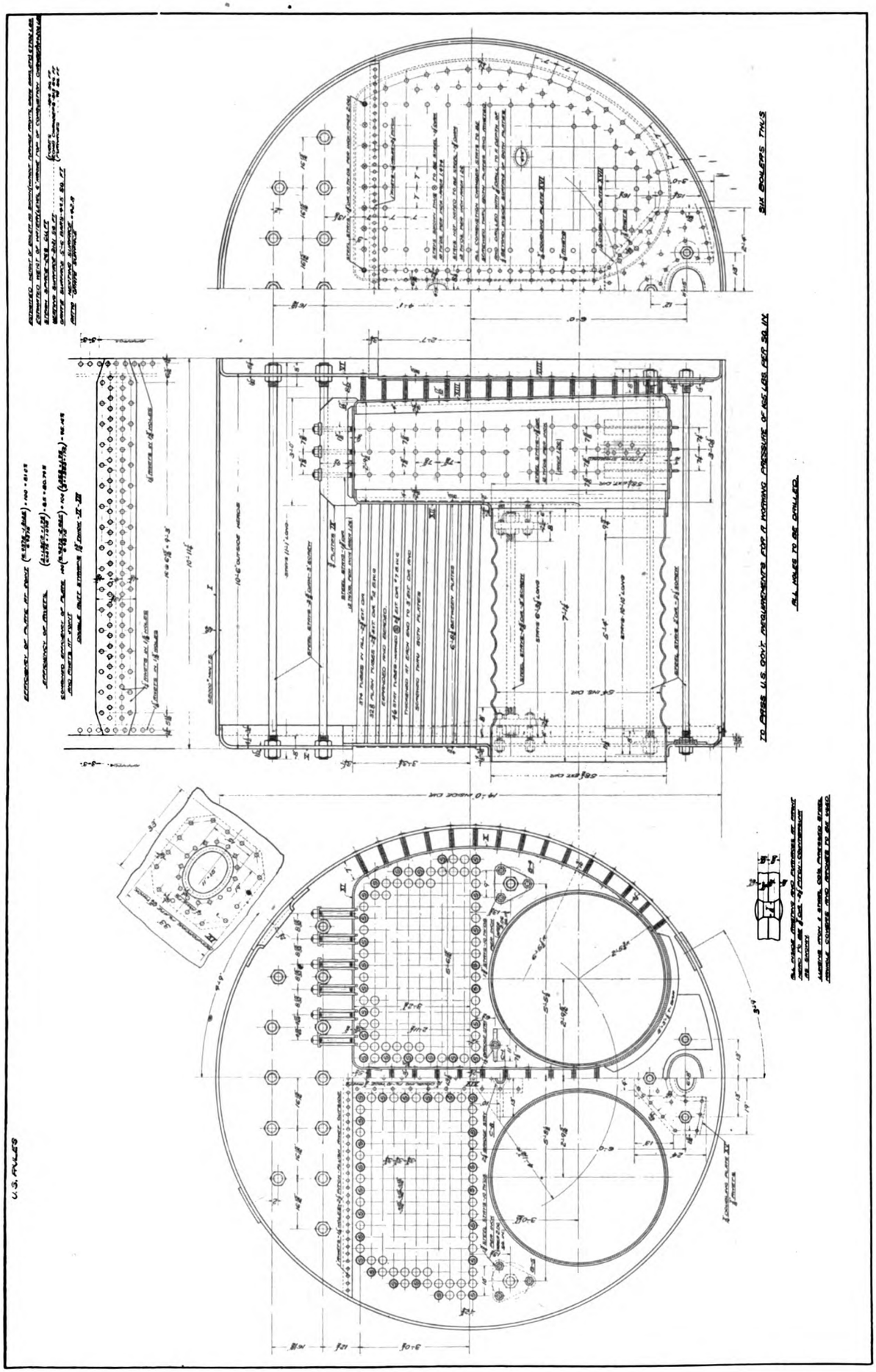


DIAGRAM OF THE SINGLE-ENDED BOILERS, OF WHICH THERE ARE SIX, ON THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

or with any fellow traveler in another stateroom, or while the ship is at dock with anyone in the city. In addition, of course, to this public telephone system, there is a private system for the operation of the ship leading from the pilot house to the engine room and other departments.

Equipped with Wireless

The steamer is, of course, equipped with wireless and also carries an auxiliary storage battery plant which will operate for six hours if by any accident the boilers should be put out of commission. Alarm boxes are placed at convenient intervals which are rung at stated times by the night patrol and register in the pilot house. An automatic signal board placed in the pilot house controls the signal lights of the ship. These lamps are carried in duplicate, one dormant and the other burning, and if by any chance the burning light goes out, the other is automatically thrown in and registers in the pilot house. Assurance is, therefore, given that the port and starboard and other signal lights are always burning, or at any rate that if anything is wrong with them it is immediately announced. The steamer is also equipped with an electric whistle device for sounding signals and can also be arranged to automatically blow the fog signal at prescribed intervals during thick weather.

In addition to the usual engine telegraph, the means of communicating intelligence from the pilot house to the engine room are many, including an electric signal bell system and also an electric indicator connected with the main shaft, which indicates whether the engines are going forward or astern. The system of electric fans throughout the boat is quite complete and is especially elaborate and painstaking in the dining room. All the drinking water is passed through copper tubes and purified by electricity before being served. Many of the functions of the galley are also performed by electricity, such as potato peeling and dish washing.

The meters in the switch board are of Weston make with General Electric sockets and Crouse-Hinds distributing panels.

The new steamer will be equipped with a 32-inch searchlight, the largest on the lakes.

Auxiliary Machinery

A very complete equipment of auxiliary machinery is installed, part of which has been mentioned in the early part of this account. The main feed pump is a 16-24-24 by 24 in. Blake tandem compound simplex pump of very massive construction. This pump will not be much used, as it is expected that the connected feed pump on the main engine will take care of all feed requirements. An auxiliary feed pump is also fitted, 14 and 8 by 12 in. Blake duplex. The fire and general service pump is a 16 and 9 in. by 12 in. duplex underwriters' pump, located on the main deck where it will be readily accessible. The fresh water service on the ship is cared for by an 8 and 10 in. by 12 in. Blake duplex pump, drawing water for four fresh water tanks of a combined capacity of 17,000 gallons.

The water for drinking purposes is all purified by an electrical apparatus furnished by the Water Purifying Machine Co., of Buffalo, N. Y.

The water closets and other sanitary systems are supplied with water by a tandem compound duplex pump 8 and 14 in. by 14 and 12 in. This pump also supplies cooling water to the main engine journals, the auxiliary injection spray heads in the main condenser and other service of similar nature. The sprinkler system throughout the ship is supplied from an 8 in. Terry turbine driven centrifugal pump located in the hold but with the throttle valve within easy reach from the handling platform so the pump can be started without going below.

As the steamer is equipped with a full water bottom ballast system, a pump is necessarily required to handle the water and accordingly a Blake vertical cross compound duplex pump 15-24 and 24 by 18 in. is installed connected to the water tanks with discharge overboard and to the trim tanks which are located on the guards.

The refrigerators and food storage spaces are cooled by a 10-ton carbonic anhydride refrigerating machine built by Kroeschell Bros., of Chicago.

The forward funnel is fitted with one 10 in. and 26 in. whistle and one 6 in. organ whistle.

The ashes are discharged outboard by eight hydraulic double jet ash ejectors of improved design. The stoke holds are roomy and well ventilated, and designed with safety escapes and with view of comfort for the stokers.

A Schuette & Koerting film feed water heater, made by the Schuette & Koerting Co., of Philadelphia, Pa., is installed, designed to raise the temperature of 200,000 lbs. of feed water from 130 at hot well to 200 at delivery with 4 lbs. back pressure.

All steam and feed piping throughout the ship is covered with 85 per cent magnesia sectional covering and in exposed places the covering is jacketed with galvanized iron. All flanged joints are straight faced with slight retaining grooves for the gaskets.

Decorative Features of the Ship

The decorative features of the vessel have been entrusted to Louis O. Keil, the marine interior decorator, who has designed the interiors of a great many steamers, notably those of the Hudson River Day Line and the Detroit & Cleveland Navigation Co. The keynote of the decorative scheme is a rich simplicity. Elaborate ornamentation has been suppressed and the result is:

The first thing that a traveler sees, of course, about a steamer, is the lobby. This is very spacious, quite as large, in fact, as the lobby of an ordinary hotel, containing the purser's and steward's offices, telephone booths, parcel and baggage rooms, and a lunch counter, the entrance of which is gained through a doorway. The lobby is designed in the Tuscan order of architecture. The walls are paneled in mahogany inlaid with various woods and the colors are in keeping with the general dominant tone of this aristocrat of woods. The ceiling decorations will be in bronze and Roman verd. Light will be obtained from ceiling and wall brackets of appropriate design. A feature of the lobby that marks quite a departure from the usual sidewheeler on the lakes is that the grand stairway leading to the promenade deck is inclosed in a vestibule with sliding doors. The purpose of this is to shut the stairway off immediately in the event of a possible fire, a very remote contingency, it must be admitted.

The main dining room is immediately abaft the purser's and steward's offices on the main deck, extending to the stern of the ship. It is carried out in Adams design with mahogany and white enamel. In addition to a banquet room 24 ft. long on the starboard side and two private dining rooms on the port side, there are a number of alcoves with bay windows on both port and starboard sides of the main room where one may have a fair degree of privacy in dining. Light is obtained from Sheffield silver candelabra carried on columns, as well as Sheffield silver wall brackets. The extreme outer end of the main dining room is taken up with a great sideboard with dumb waiter leading to the buffet on the orlop deck below. The dining room is 72 ft. long, 60 ft. wide at the forward end, taper-

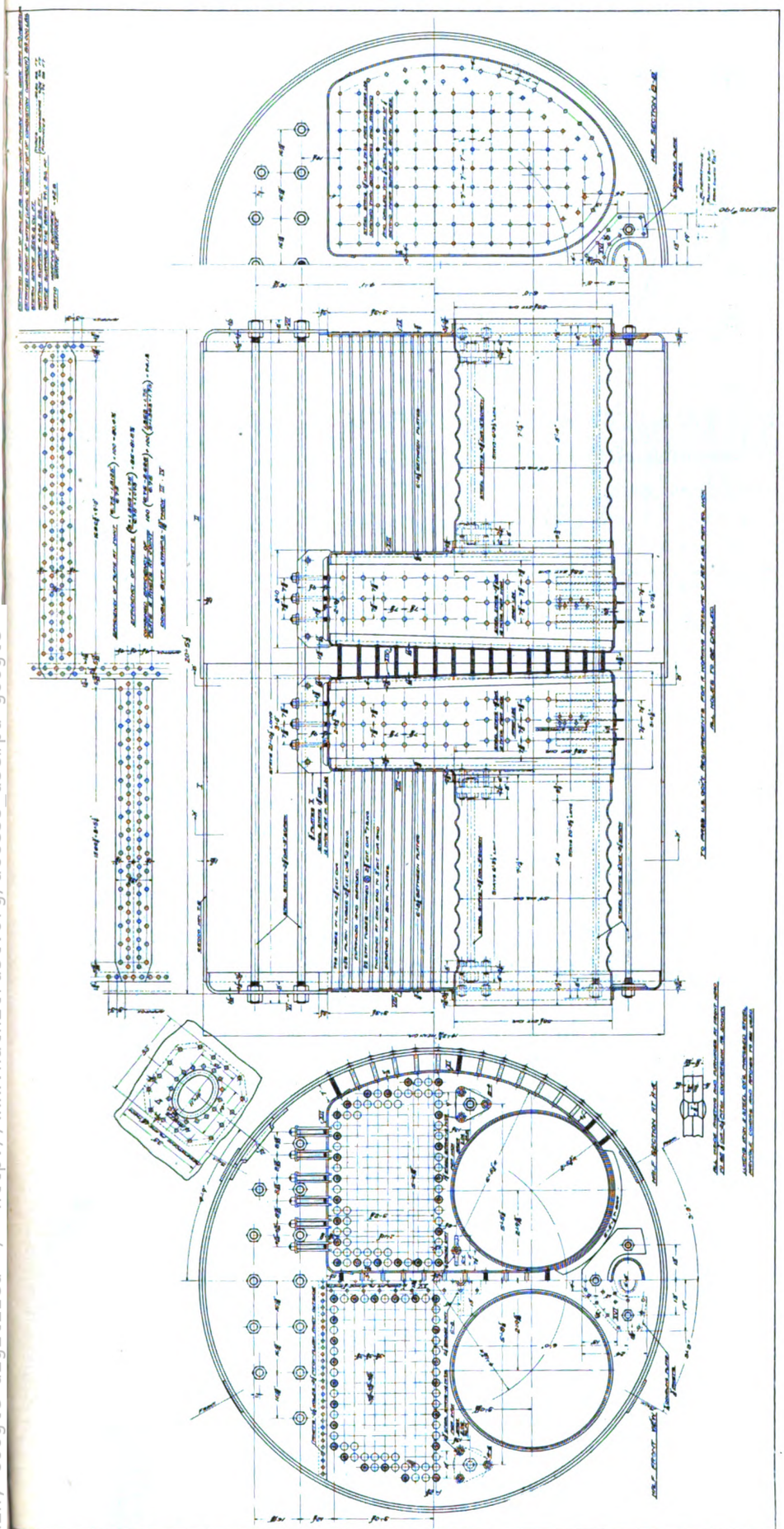


DIAGRAM OF DOUBLE-ENDED BOILERS, OF WHICH THERE ARE THREE, ON THE CLEVELAND & BUFFALO TRANSIT CO.'S NEW STEAMER SEE-AND-BEE

ing to 32 ft. aft, and will seat 170 persons at one time. The location of the dining room on the main deck is a happy one, as it permits the passenger to look out over the waters as the boat speeds along. This feature was first introduced on the lakes on sidewheelers on the City of Detroit III, and was much appreciated by the traveling public, the dining room hitherto having been located on the orlop deck.

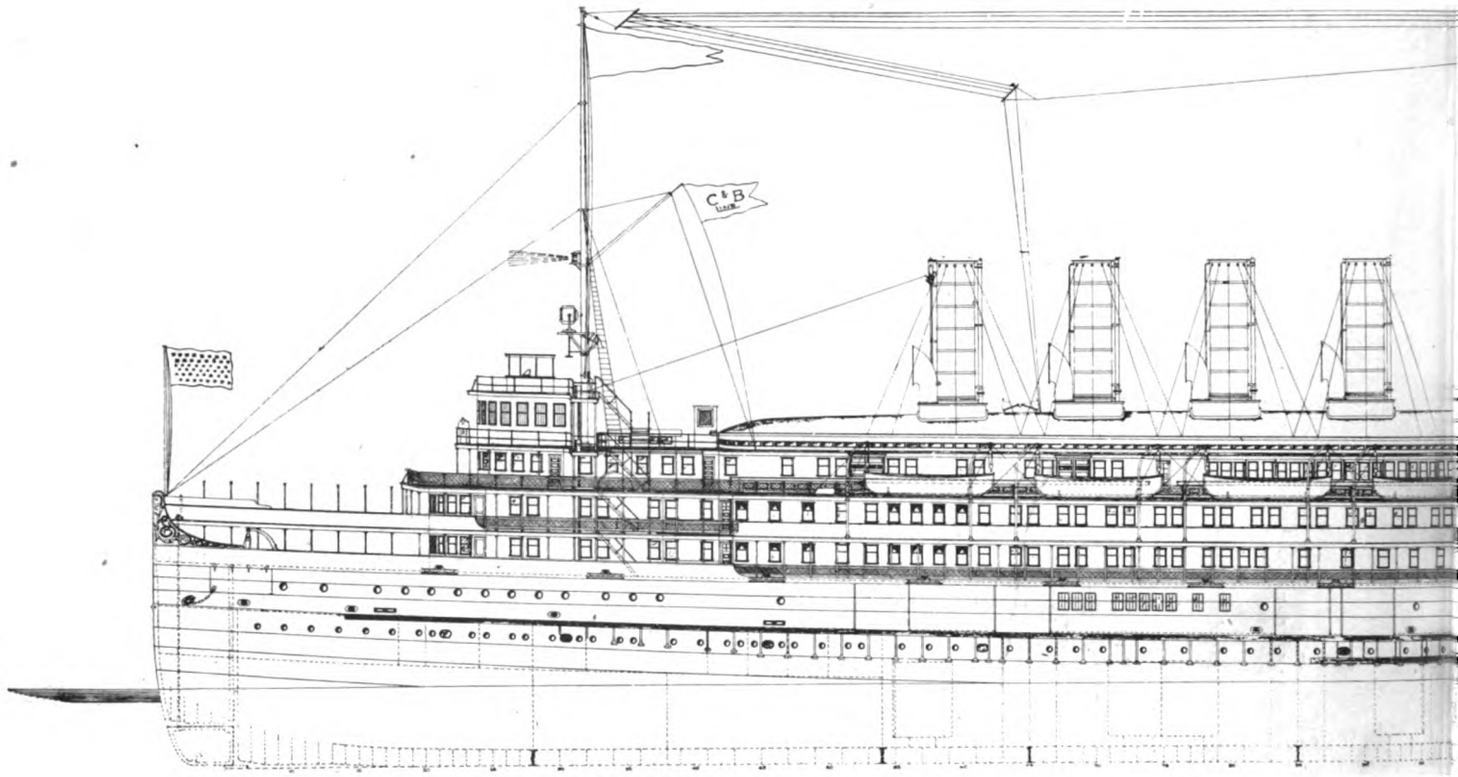
The buffet, as stated, is directly under the dining room and is approached by a stairway on the main deck aft. It will be in tavern design after the manner of an old English inn and will call to mind the remark of the great Dr. Samuel Johnson, that nothing was ever contrived that gave mankind so much creature comfort as a good tavern.

The Main Saloon

Passing from the lobby through a vestibule and up a wide and handsome flight of stairs one enters the main saloon, upwards of 400 ft. long, on the promenade deck, and subdivided for convenience into several sections, having flower booths, a book and periodical store, observation room and ladies' writing room amidships and men's writing room forward. The style of the main saloon is in the Ionic order of architecture, having a wainscot of carefully selected mahogany highly finished, the upper part finished in fine enamel. The general effect, however, will be one of perfect simplicity and no decorative features whatever will be attempted except that the ceilings in both forward and after sections of the saloon and the cross-bulkheads formed by the stair landings will have mural paintings. The main dependence for decorative effect will be in the ceiling painting which will be devoted wholly to one subject and will be executed by one of the foremost mural painters in the United States.

The general color scheme of the gallery deck will be gray, ivory and white, chaste, simple and refined. At the after end of the gallery deck is the ladies' drawing room of Italian renaissance design with built-in seats at after end in walnut. The furniture in this room will be of walnut covered in tapestry and the floor covering of the best Wilton. The room will be lighted by ceiling fixtures and the general color scheme will be rose.

On the upper deck immediately above the drawing room will be located the atrium. The meaning of an atrium is a Pompeiian court with



OUTBOARD PROFILE OF THE SIDEWHEEL PASSENGER STEAMER

sleeping rooms adjoining, and of course it is quite apropos to call it such, as the staterooms actually do adjoin, with molded entablature extending around entire court. Wall pilasters at the forward end support a pediment. It will be carried out in the full spirit of a Pompeiian court, the color scheme being light, but relieved by rich Pompeiian colors, flower stands about the room and the ceiling painted to represent the sky and the open air. The electric fixtures will be in the form of bronze torches and everything will be in keeping with Pompeiian thought. In the center will be an open well looking down upon the drawing room.

In this connection it is pertinent to note that a balcony for orchestra will be located at the after end of the main saloon, just forward of the ladies' drawing room on the gallery deck above. It will thus be observed that the orchestra is so placed that its music reaches not only the main saloon but the drawing room and atrium on the upper decks as well.

Probably the most popular feature of the ship will be the lounge on the upper gallery deck amidships. It will be conventional in design, finished in fumed oak, and the decorative features in L'Art Nouveau will be painted right on the wood. The stack casing which penetrates this room will be utilized to carry panel paintings. This room may also be reached by a forward stairway leading from the promenade deck between the stacks to the upper deck, carrying electric fixtures in L'Art Nouveau on the newell posts. An air of comfort and coziness will be imparted to the lounge by numerous little bays on both port and starboard sides where one may indulge in light refreshments, such as ice cream, which will be served from a counter built-in at the after end of the lounge. This counter will be a model of sanitation, being constructed of opal and German silver. As this will be a common meeting ground for both men and women, the purpose is to make it as inviting and comportable as possible. The floor will be of asbestolith which will be divided into squares by brass strips to represent tiling. With its fumed oak furniture this room will doubtless prove a very attractive one.

Bordering the main saloon will be a number of parlors, the principal ones being named by courtesy in honor of the president, general manager, traffic manager and directors. Each room will be of different de-

DATA OF STEAMER SEE-AND-BEE.

Hull, length, keel, 485 ft.; overall, 500 ft.; breadth, 58 ft.; over guards, 96 ft. 6 in.; depth, 23 ft. 6 in.

Engines, inclined three-cylinder compound, 66 in., 96, 96 x 108 in. stroke.

Boilers, six single-ended 14 ft. x 10 ft. 6 in., two 54-in. furnaces. Three double-ended, 14 ft. $2\frac{9}{16}$ x 20 ft. $5\frac{1}{2}$, four 54-in. furnaces. Working pressure, 165 lbs. All grates 5 ft. 6 in. long. Total grate surface, 594 sq. ft. Ratio, 42.8.

Howden draft. Four No. 9 Sirocco blowers, direct connected to double 7 x 7 American Blower Co. enclosed engines.

Heater, one Schutte & Koerting film 200,000 lbs. capacity.

Feed pumps, two 8 in. diameter x $41\frac{1}{2}$ stroke, connected to main engine. One Blake 16-24-14 x 24 independent horizontal simplex plunger type.

Wheels, 32 ft. 9 in. overall, 11 buckets 5 ft. wide, 14 ft. 10 in. long, $1\frac{3}{8}$ in. thick.

Draught of water, mean. 14 ft.

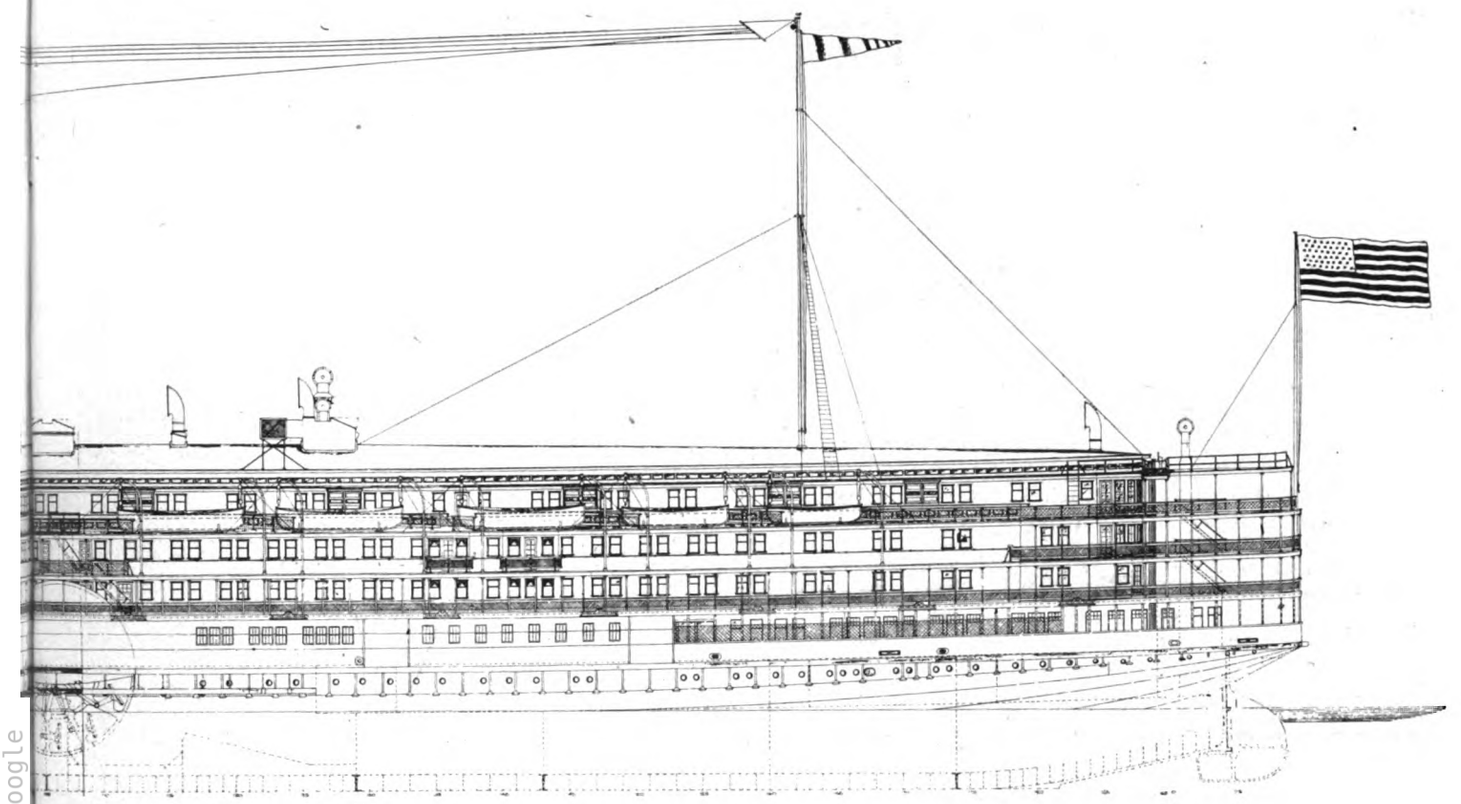
Total heating surface all boilers, 25,452 sq. ft.

I. H. P. at 31 revolutions—558 piston speed.

$$\frac{558 \times 49 \text{ M. E. P.} \times (\text{area (2) lows}) \ 14476.5}{33{,}000} = 11{,}974 \text{ I. H. P.}$$

Weight of Parts.

	Tons.
Low pressure cylinders	33
High pressure cylinder	29
Connecting rods	12
Paddle wheels complete	100
Main shafting	120
Boilers without grates	408



SEE-AND-BEE OF THE CLEVELAND & BUFFALO TRANSIT CO.'S FLEET

sign, being finished in either vermilion wood, satin wood, mahogany, red gum wood, silver gray maple, prima vera and enamel. The furniture and decorations of each of these parlors will be in keeping with the character of the wood finish. Each parlor will contain twin brass beds, a divan, tables, dressers, chairs, mirrors and plenty of cushions to lend an air of comfort. Each of these parlors will have a private bath finished in pure white enamel, and in addition the rooms which are named in honor of officers of the company will have private balconies. The lighting fixtures of the parlors will be carried out in Sheffield silver and Tuscan gold. Some of the parlors will moreover be paneled in silk, brocade and finely embroidered curtains which richly dress the windows.

Naval Architects and Marine Engineers

The twentieth annual meeting of the Society of Naval Architects and Marine Engineers will be held in the Engineering Societies building, 29 West Thirty-ninth street, New York, on Nov. 21 and 22, followed by a banquet in the Astor gallery of the Waldorf-Astoria on the evening of Nov. 22. The program of papers to be discussed is as follows:

Thursday, Nov. 21, 1912.

"Experiments on the Fulton," by Prof. C. H. Peabody, member of council.

"The Design and New Construction Division of the Bureau of Construction and Repair, Navy Department." by Naval Constructor R. H. Robinson, U. S. N. member.

"Engineering Progress in the U. S. Navy", by Capt. G. W. Dyson, U. S. N.

"Marine Lighting Equipment of the Panama Canal," by James Pattison.

"The Lightship," by George C. Cook.

"Oil Fired Marine Boilers," by E. H. Peabody, member.

"The Preservation of the Metals Used in Marine Construction," by Lieut. Com. Frank Lyon, U. S. N.

Friday, Nov. 22, 1912

"An Electrically Propelled Fireproof Passenger Steamer," by W. T. Donnelly and G. A. Orrok, members.

"Notes on Fuel Economy as Influenced by Ship Design," by E. H. Rigg, member.

"Different Applications of the Marine Gyro in Science," by Elmer A. Sperry, member.

"Rudder Trials of the U. S. S. Sterett," by Asst. Naval Constructors R. T. Hanson, U. S. N., and J. C. Hunsaker, U. S. N., juniors.

"Logarithmic Speed Power Diagram," by Thomas M. Gunn.

Piers for High Level Bridge

The Great Lakes Dredge & Dock Co., of Cleveland, has secured the contract for the construction of nine land piers for the new high level bridge over the Cuyahoga river at Cleveland, as well as the capping of the two river piers, the contract involving an expenditure of $498,000. Piers 1 and 2 will have two caissons in each. These are located on the hill side. The three piers on Merwin street will have deep cofferdams and the four piers near the Erie station will be based on concrete piles. About 27,000 cubic yards will be excavated in the wet and 20,000 cu. yds. in the dry. Between 3,000 and 4,000 tons of steel sheet piling will be used and about 30,000 yds. of concrete. The contract calls for the completion of the work in 600 working days.

The Greenport Basin & Construction Co., Greenport, L. I., is building a tug 75 ft. long for the Breakwater Co., of New York, for service in Honolulu, where it is building a breakwater from the lava of an extinct volcano. The tug will be shipped to Hawaii in a knocked-down condition.

THE MARINE REVIEW

DEVOTED TO MARINE ENGINEERING, SHIP BUILDING AND ALLIED INDUSTRIES

Published Monthly by

The Penton Publishing Company

Penton Building, Cleveland.

CHICAGO - - - - - - - 1328 Monadock Blk.
CINCINNATI - - - - - - - 503 Mercantile Library Bldg.
NEW YORK - - - - - - - - 1115 West Street Bldg.
PITTSBURGH - - - - - - - - 2148-49 Oliver Bldg.
WASHINGTON, D. C. - - - - - - - - Hibbs Bldg.
BIRMINGHAM, ENG. - - - - - Prince Chambers

Subscription, $2 delivered free anywhere in the world.
Single copies, 20 cents. Back numbers over three months, 50 cents.

Change of advertising copy must reach this office on or before the first of each month.

The Cleveland News Co. will supply the trade with THE MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

November, 1912

Artificial Waterways on the Lakes

Few people realize the extent to which the commerce of the great lakes is cared for in artificial channels, but in the run from Duluth to Buffalo vessels traverse a waterway that for 50 miles is wholly artificial, that is to say canals, locks, and straightened and deepened channels in the rivers. The latest of these and one of the greatest was dedicated to commerce on Oct. 19—the Livingstone channel at the mouth of the Detroit river, making a downbound track for vessels and eliminating the Limekiln Crossing, hitherto the point of greatest concern to the navigator on the whole chain of lakes.

The interesting part of the work was the building in the dry of the channel opposite Stony Island. The river at this point was cofferdammed and unwatered, the contractors taking chances in finding underground seams in the rock or the flooding of the area through unusually high stages of water. None of these things fortunately developed and the work was prosecuted to a successful conclusion in the dry, meanwhile being an object of great interest to thousands of visitors. The government spent about $6,600,000 on the work and congress named the channel in honor of William Livingstone, president of the Lake Carriers' Association, who had conceived it.

In appropriating money liberally for the widening, deepening and straightening of lake channels, the government displays the highest wisdom. The area to be improved is slight in comparison to the area which needs no improvement, namely, the open lake, where nature has provided an adequate depth for all time. The government had only to develop 50 miles to make the remaining 950 miles serviceable. An examination of the figures will show that the freight rate has fallen coincident with the deepening of the channels. In fact, the saving of a penny a ton on the commerce that will annually pass through the Livingstone channel will repay the cost of the whole improvement in ten years. More than that, all that the government has ever spent in improving the great lakes is returned to the people annually in the saving of transportation costs. It is absurd to suppose that the vessel owner gets the benefit of the deepened channel. Whatever advantage he may have in the obtaining of a deeper channel is only momentary. The rate automatically adjusts itself to the changed conditions and the people get the benefit.

Importing Ship Material Free

Attention was directed in these columns last month to the rider in the Panama canal act admitting free of duty all materials intended for the construction, equipment or repair of vessels in American yards, irrespective of the trade in which they are to engage. The provision, of course, makes it possible to import materials for the construction of vessels to engage in our coastwise service. It may even make it possible to import the material to replace the equipment when it becomes worn out, but upon this particular feature the Treasury Department is expected to make a ruling. The measure has only been in effect a few months, but it has already become a serious menace to a number of American industries. If the United States is anything at all, it is a protective country and why on earth one industry should be singled out and denied the advantage of protection is more than we can understand. Protection is extended to every industry except shipping and now it is being denied to the makers of auxiliary equipment for vessels. If an American manufacturer makes a pump to install in a factory or office building, he is protected; but if he makes it for a ship, he is not protected. The same is true of the makers of all marine auxiliaries, and the sooner that that rider is rescinded the better it will be for American industry. It is unfair and un-American.

Assigned to Seats in Lifeboats

It is reported that the Toyo-Kisen-Kaisha has decided to assign its passengers to certain seats in its lifeboats. To each ticket sold is attached a coupon representing a certain seat with a printed request to the passenger to acquaint himself immediately on going aboard with the location of the particular boat with which he is allotted.

We are rather inclined to think that the primary effect of this would be to give the passenger a rather uncomfortable feeling. The last thing that a passenger thinks of is the safety of the ship. Moreover, the

arrangement has many absurd features. The vessel may have a list rendering useless the life saving equipment on the high side. Are the passengers so unfortunate as to be assigned to the boats on that side to be content to waive their claims to safety?

The conditions which obtained at the time the Titanic sank are very rare. The sea upon that occasion was quiet and no difficulty was experienced in lowering the boats and yet if the Titanic had had more lifeboats than were carried, it is doubtful if they could have been launched in time. The safety of the passenger lies in the hull of the steamship itself. With the hull well subdivided, both longitudinally and transversely for a fair distance above the waterline, the passenger is reasonably safe. Too much importance is being attached to life boats and life saving equipment. Dangers cannot be totally eliminated from travel either on land or sea, and he who travels either on railway trains or steamboats must expect to assume a certain risk.

Building in Borneo

It is not often that a small vessel is built at such an out-of-the-way place as Borneo, and therefore it will create some surprise that an order has been placed there for the construction of a steamer of 500 tons gross register. The builders are the China-Borneo Co., and the owners are the South Philippine Steamship Co., and the most surprising thing of all is that the vessel is to fly the American flag. It is certainly a strange thing that they can build ships for the foreign trade in Borneo to fly the American flag, while we cannot build them in the United States at all for that trade.

Statistics of Internal Commerce

If proposals recently suggested are worked out, the railroads will within a year or more be reporting the kinds and volume of commerce carried over their lines, as will also the steamship companies, to the Interstate Commerce Commission, in addition to the present financial statement that is monthly and yearly. This plan has arisen incident to the proposal of the reorganized Bureau of Domestic and Foreign Commerce in the Department of Commerce and Labor to eliminate hereafter the statistics on internal commerce. This bureau is not collecting the statistics this year, owing to the failure of congress to allow an appropriation. The figures were very valuable to the Interstate Commerce Commission and have frequently been used by the commission in estimating costs of service. It has been suggested that the commission itself arrange to collect this data in the future. It is believed that under the law the railroads and steamship lines could be required to make reports on the kinds and volume of commerce handled by them to the Interstate Commerce Commission.

These traffic reports are very valuable and it is regrettable that they should have gone so long uncollected. The Bureau of Statistics a few years ago took up the work of collecting the statistics of waterborne commerce, but as the giving of the information was not mandatory the statistics were obviously incomplete and some of the lines failed to furnish the information. There is no good reason why the information should not be forthcoming, and there are many why it should. It affords a very reliable index of the general growth of industry. If the power of the Interstate Commerce Commission to collect this data is not ample, it should be made so.

Enlarging Suez Canal

That the Suez canal authorities are alive to the changed conditions that will be brought about when the Panama canal is opened to commerce is clear from the recent declaration of Prince d'Arenberg, president of the Suez company, that the Suez canal will have to be enlarged to meet the increasing dimensions of ships, and in this view he is in line with the most progressive canal authorities of today. He recently said: "The Panama canal will be completed, that is now certain, within a time near at hand. I persist in believing that it must be looked on as a complement rather than a competitor of the Suez canal. The latter will always remain the shortest route from Europe to the extreme east, and will retain the superiority which the existence of frequent ports of call confer. It is not necessary to fear the Panama canal, on one condition, however, namely, that the Suez Canal Co. executes within the desired period the necessary works so as not to be behindhand in the march of progress. The Panama canal will be a wide and deep waterway, wider and deeper than the Suez canal in its present dimensions. A barrier must not arise between the Mediterranean and the Red Sea, a barrier not to be overcome by those vessels which commercial undertaking, impossible to predict in advance, might bring to the districts dependent naturally on the Panama canal from those which the Suez canal serves."

It is the opinion of Mr. Corthell that, if it is to retain its traffic, the Suez Canal Co. may give to commerce the canal dimensions that it requires. He declares that within a few years the Suez canal will necessarily have to be enlarged in order to hold its business, so that its depth will be at least 42.6 ft., allowing for a draught of 39.4 ft. with corresponding width to permit the passage in two lines of vessels of 25,000 tons.

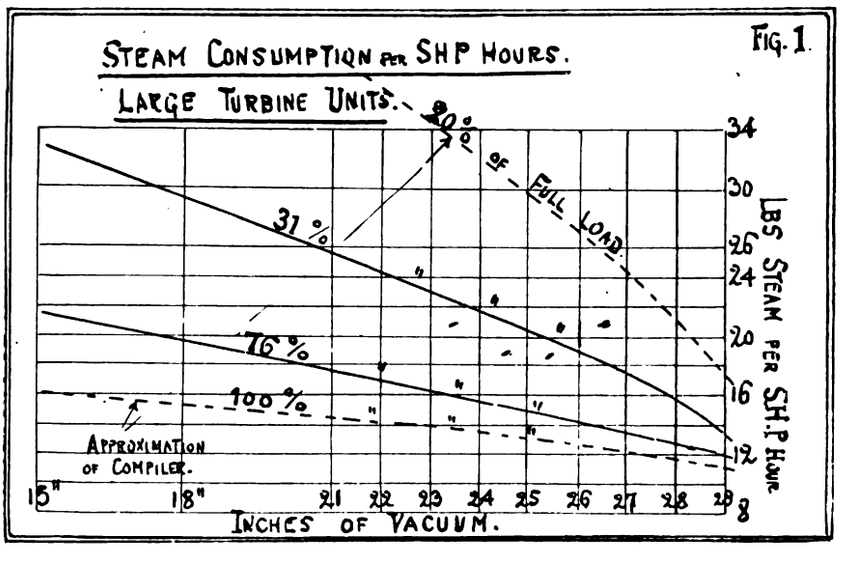
The great development of the Dutch Indies, of Japan after the war, and the awakening of China, the opening up for foreign trade of Manchuria, a rich country of an immense superficial area, the very important export from Manchuria are indications demonstrating that the commerce between Europe and the countries situated on the far side of the Suez canal will undergo a very rapid change.

Marine Steam Engineering

Recent Developments of Steam Engineering Practice and Its Future Outlook—The Steam Turbine and Superheated Steam

By Theodore Lucas

DEVELOPMENTS take place repidly in all modern industrial expression of our times and not the least in the field of marine engineering. Until a few years ago steam seemed the only power available for economical or large ship propulsion, but now the most recent experiments in the field of internal combustion of heavy oils seem to open up a fine prospect for this type of machinery in many cases. It would, however, be somewhat premature if the enthusiastic advocates of this motive power see an immediate necessity for scrapping all steam power plant and it well pays to recall and study the fine strides that marine steam engineering has taken in the last few years. Many able technical and inventive minds contribute every year to the store of our knowledge how to make steam serve still better and still more economical.



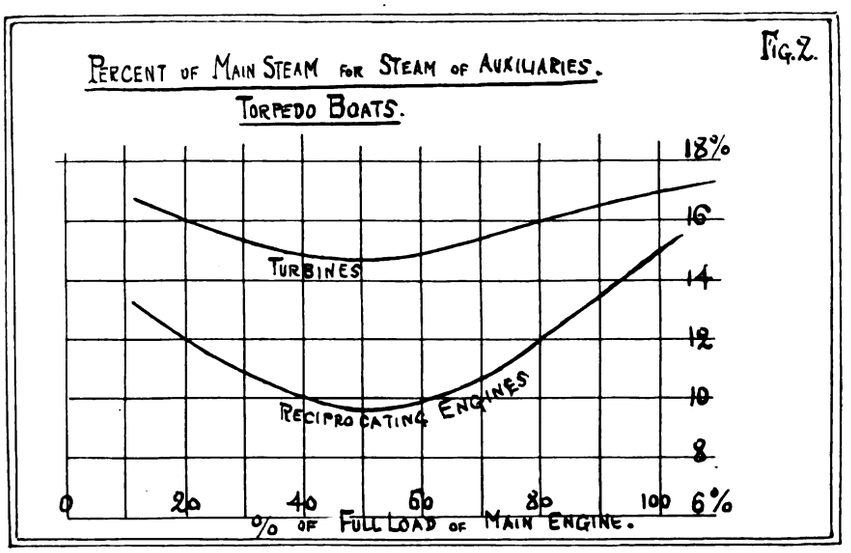
But advance we must or we shall fall behind. Hardly have owners and builders made up their minds to consider substituting in certain suitable cases steam turbines for reciprocating steam engines that their attention is called to still higher forms of turbine economy than a direct drive will give. Good steam economy, say 12 to 14 lb. per S. H. P., it was called from high and medium speed turbines, and if the propeller efficiency was not quite the best, it was or is accepted for simplicity's sake as the best all around compromise. Now comes the newer forms of interposing mechanical or hydraulic gear reductions or reversing apparatus, or even mechanically separating turbine and propeller entirely with only electrical connection between them, that at once gain high efficiency from the turbine as well as from the propeller, and realizing also full backing power. An additional advantage of this last arrangement is that the same motive power of the main propulsion is also wholly or partly available for auxiliary purposes. This power application from one central source has, of course, great conveniences as electrical auxiliaries, while high in first cost, are fully able and reliable to fill all wants of auxiliary machinery on board ship.

It is possible, however, that a prejudice will remain with many marine men against any power agent that is not direct-connected to the propeller at its most efficient revolutions or that is not able to answer immediately to a call for powerful positive and direct reversal and backing in urgent cases for avoidance of collisions or accidents.

The Old Reliable Reciprocating Engine

The old reliable reciprocating marine steam engine of multi-cylinder type fills all demands that reasonably can be made upon it for swinging its propeller efficiently as well as positively in any direction demanded. It is, however, deficient and inferior to the steam turbine in point of steam economy at maximum power and in revolving balance, which, in a steam turbine without reciprocating parts is, through its very nature, more easily perfect.

The ardent advocates of the steam turbine, however, were some six or



eight years ago making light of some of the drawbacks that have loomed up bigger and bigger in the light of recent experience and that

have even led to serious consideration or even decision to return for heavy naval construction to reciprocating engines. The principal objections to the steam turbine, leading to this, are:

I. High number of revolutions and consequently reduced efficiency of propellers.

II. Expense or difficulty of getting full running balance of the high speed propeller, which frequently has set up vibrations of the hull nearly as serious and disagreeable as any reciprocating engine.

III. Difficulty of getting the very small clearances between the running and the stationary blades so well adjusted that no serious loss of efficiency by leakage may be incurred while still avoiding danger of touch and slipping of blades, which has proved to be very expensive in repairs.

IV. Greatly reduced efficiency at half or low powers, a very pronounced consideration for naval vessels.

V. Great dependence upon an extra good vacuum, 27½ inches or 28 inches now universally being demanded for turbine installations.

A number of tables as published before the German Society of Naval Architects, by the marine expert, Bauer, may well illustrate the points in view. Table I gives the clearances considered desirable for Parson turbines.

TABLE I.

	Large cruiser. In.	Torpedo boat. In.	In.	In.
H. P. cruising turbine	0.044	0.052	0.040	0.044
L. P. cruising turbine	0.050	0.060	0.040	0.044
H. P. full power turbine	0.056	0.068	0.048	0.064
L. P. full power turbine	0.080	0.120	0.072	0.100
H. P. backing turbine	0.064	0.080	0.064	0.088
L. P. backing turbine	0.080	0.112	0.064	0.088

At full load with 27½ inches of vacuum it is stated that a S. H. P. may be realized at 12.1 to 14.3 lb. of steam per hour. How important the vacuum is for the economy of turbines is illustrated by Fig. 1, which gives steam consumption for 76 per cent and 31 per cent of normal load.

The steam consumption of the auxiliaries expressed as a percentage of the steam used by the main engines of torpedo boats is shown in Fig. 2 at decreasing percentages of the normal load. In 1901, the marine expert, James McKechnie, gave the weights of turbine machinery as only 70 per cent of that of reciprocating machinery of equal power.

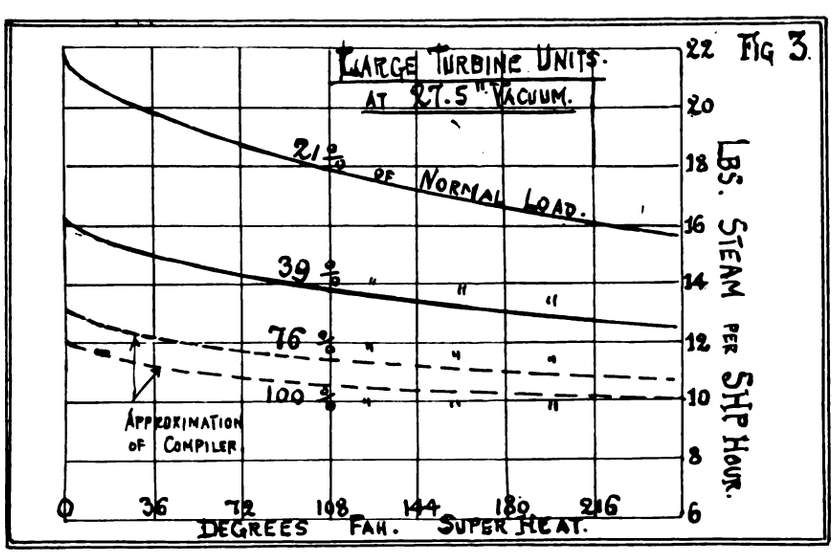


FIG 3.

Since it has been found, however, that additions to the condensing apparatus are desirable, also more subdivision of main engines into forward and backing turbines, cruising and full power units, etc., so that the review by Bauer comes to the conclusion that for heavy naval and probably also mercantile outfits, the weights are practically equal. A saving of weight may be realized in torpedo boats of 30 knots with 13 per cent, 32 knots with 15 per cent, 36 knots with 16 per cent, and for small cruisers of 25 knots with 7 per cent to 10 per cent.

It is noteworthy that the economy of the steam turbine has practically remained the same during the last decade at approximately 12 to 14 lb.

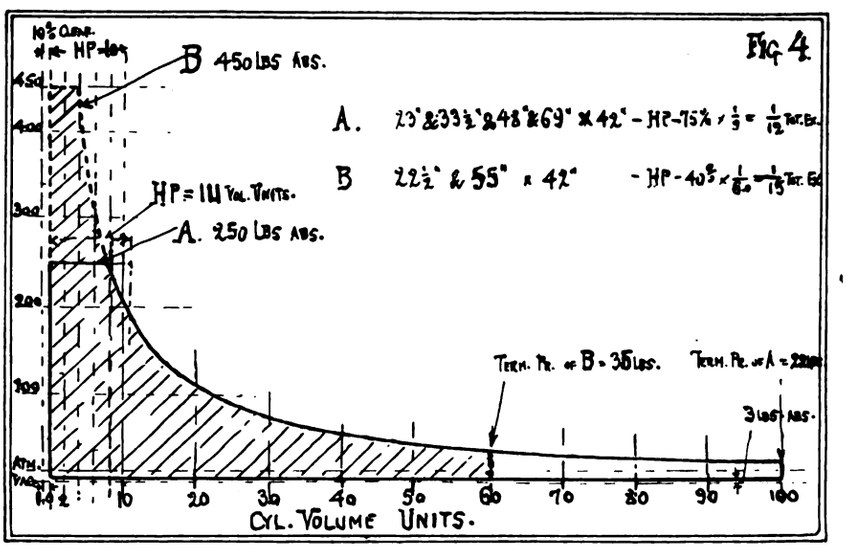


FIG 4.

This is, of course, very promising for all steam engines and its effect upon steam turbines is illustrated by Fig. 3. The dotted curves are additions by the writer for approximate values at 75 per cent and 100 per cent of normal load. It should be noted in this connection that Mr. Parsons never seemed to be an ardent advocate of super-heating for turbines. Only wider experience will show if high temperatures should warp the shape or deteriorate the material of the numerous fine blades that depend for their efficiency upon so close an adjustment.

But the turbine is not alone any more in the field of high economy. In the last few years notable modifications of reciprocating engines have been produced that promise quite pronounced economies in steam consumption. This is made possible largely by reduction of initial condensation and thereby opens up the possibility of using economically shorter cut-offs and greater

temperature ranges with the possibility of simpler and less costly engines of fewer cylinders.

Two Notable Improvements

There are mainly two notable improvements which have originated or at least been brought to the latest stage of development by the Germans.

I. The poppet valve, high superheat, reciprocating engine, best known as the Lentz type after its designer.

II. The uniflow or through-flow engine, best known as the Stumpf type, after the designer of one form of it.

The first type avowedly pins its faith upon super-heat and even high superheat going as high as 750 degrees Fahr. with a super-heat of more than 350 degrees Fahr., and realizing apparently quite successfully as high as 20 per cent to 21 per cent of coal economy over saturated steam. The poppet valves are adopted to prevent rubbing motion of the steam distribution members, which, under the dryness of the superheat, might lead to scoring, leakage and large repairs. Inlet and outlet ports are separated, gaining thereby in efficiency through reduction of initial condensation. The poppet valves lend themselves also to small clearance spaces, in one case 7 per cent of H. P. cylinder for a Lentz engine against 14 per cent of a compared regular piston valve type. The arrangement of the Lentz engine has been carefully worked out in fair simplicity and the number of 300 installations—as quoted before the German Society of Naval Architects, seem to prove good life and wearing qualities of cams, springs and valve faces. Regular marine reversing gears of the type of Stephenson links or spiral feather sleeve gears are employed in but light scantlings as the friction is small and the wear not severe. In the summer and fall of 1906 the first conclusive comparison between a regular triple and a Lentz-triple engine was made by a French shipping company in two ships, duplicates in everything except engines and superheating arrangements. La Garonne with saturated steam of 195 lb. had an I. H. P. of 1,101, a M. E. P. referred to L. P. of 26.46 lb. per sq. in., and a coal consumption of 1.124 lb. per I. H. P. hour. La Rance with 536 degrees Fahr. steam temperature and a superheat of about 160 degrees Fahr. at 196 lb. pressure, had an I. H. P. of 1,290, a M. E. P. referred to L. P. of 30.58 lb., and a coal consumption of 0.898 lb. per I. H. P. hour, certainly a remarkable performance. The commercial result of these comparative installations was to show that La Rance, during 10 round trips of a year's operation, realized 18 per cent gain over the coal consumption of La Garonne. Another case of comparison was instituted by a German shipping company, installing a Lentz double compound engine, 2-26⅜ inches and 2-55 inches by 52½-inch stroke by 85 R. P. M. in their steamer Answald in opposition as a sister ship with a normal quadruple expansion engine for saturated steam. The Answald carries 202 lb. pressure at 626 degrees Fahr. to 716 degrees Fahr. steam temperature or 244 degrees Fahr. to 334 degrees Fahr. superheat and realizes 3,200 I. H. P. with a coal consumption of 1.164 lb. per I. H. P. hour. The sister ship uses 1.32 lb. coal per I. H. P. hour. The most noteworthy improvement in this case is that the Answald can get her power from three boilers, while the sister ship needs four. This enables the Answald to enlarge her bunker capacity by about 7,000 cu. ft. and to stow 160 tons more coal without encroaching upon the cargo space.

Engine for Torpedo Boat Service

A remarkably handsome engine of this type, built by works of Heinrich Lantz, in Mannheim, of 6,000 I. H. P., for torpedo boat service, was exhibited last year at the Brussels exposition.

The engine, with four cylinders, each 40 in. by 20-in. stroke—one H. P. expanding into 3 L. P.'s—by 250 R. P. M. and 240 lb. steam was shown to occupy no more space than an equal torpedo boat turbine outfit at 650 R. P. M., but being actually lighter and having a condensing outfit of 30 per cent less in weight than a turbine outfit would require.

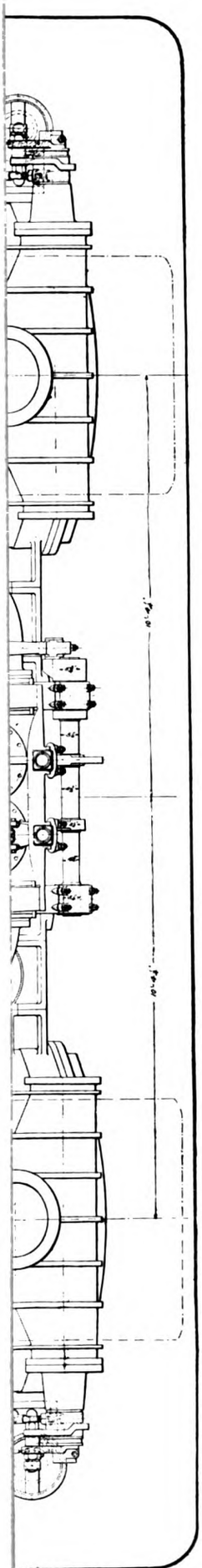
All of these performances are referred to economy in coal consumptions and the deduction lies near that it is the superheating arrangement of the boiler that produces the economy and any engine that can successfully be worked with superheated steam may be expected to show equally good results.

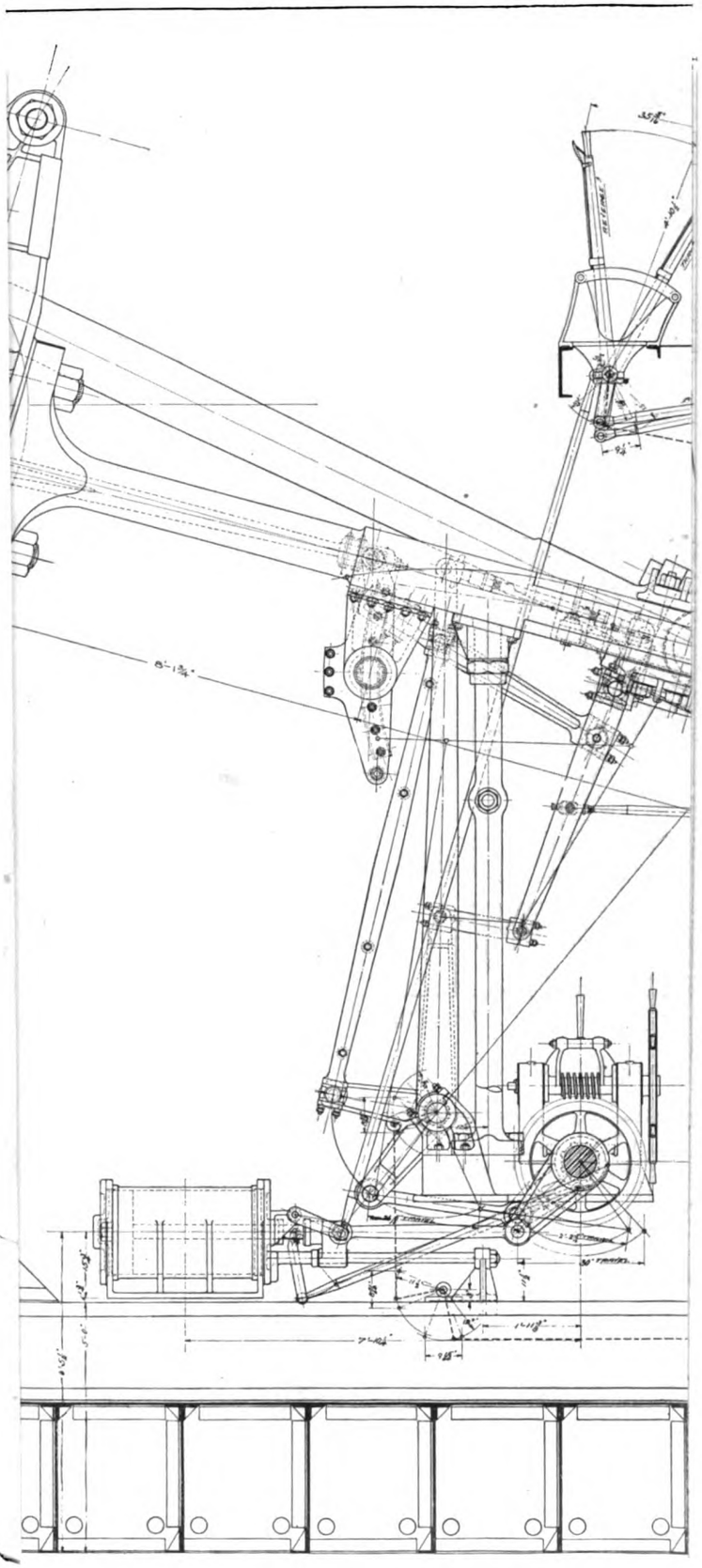
The German government installed a Lentz poppet valve engine in connection with Schulz water tube boilers and fitted with superheaters in the navy water tender Drache, and made quite exhaustive tests on the plant. These tests as well as other experiments with superheaters seem to indicate rather where difficulties might arise. Two points principally seem important, one concerning the boiler and one concerning the engine. For reasons of rapid heat transmission it has been found desirable and almost necessary to arrange the superheater coils where the temperature of the gases of combustion is still quite high. When, however, the engine shuts down suddenly or temporarily and when steam does not flow through the superheater rapidly, its tubes become so overheated, that it may rapidly lead to deterioration of the material and extensive repairs. This danger seems so pronounced that the Drache had the superheater arranged in a by-pass and the Yarrow Co. now proposes to by-pass the gases around the superheater, whenever steam is not flowing actively through the superheater.

Question of Lubrication

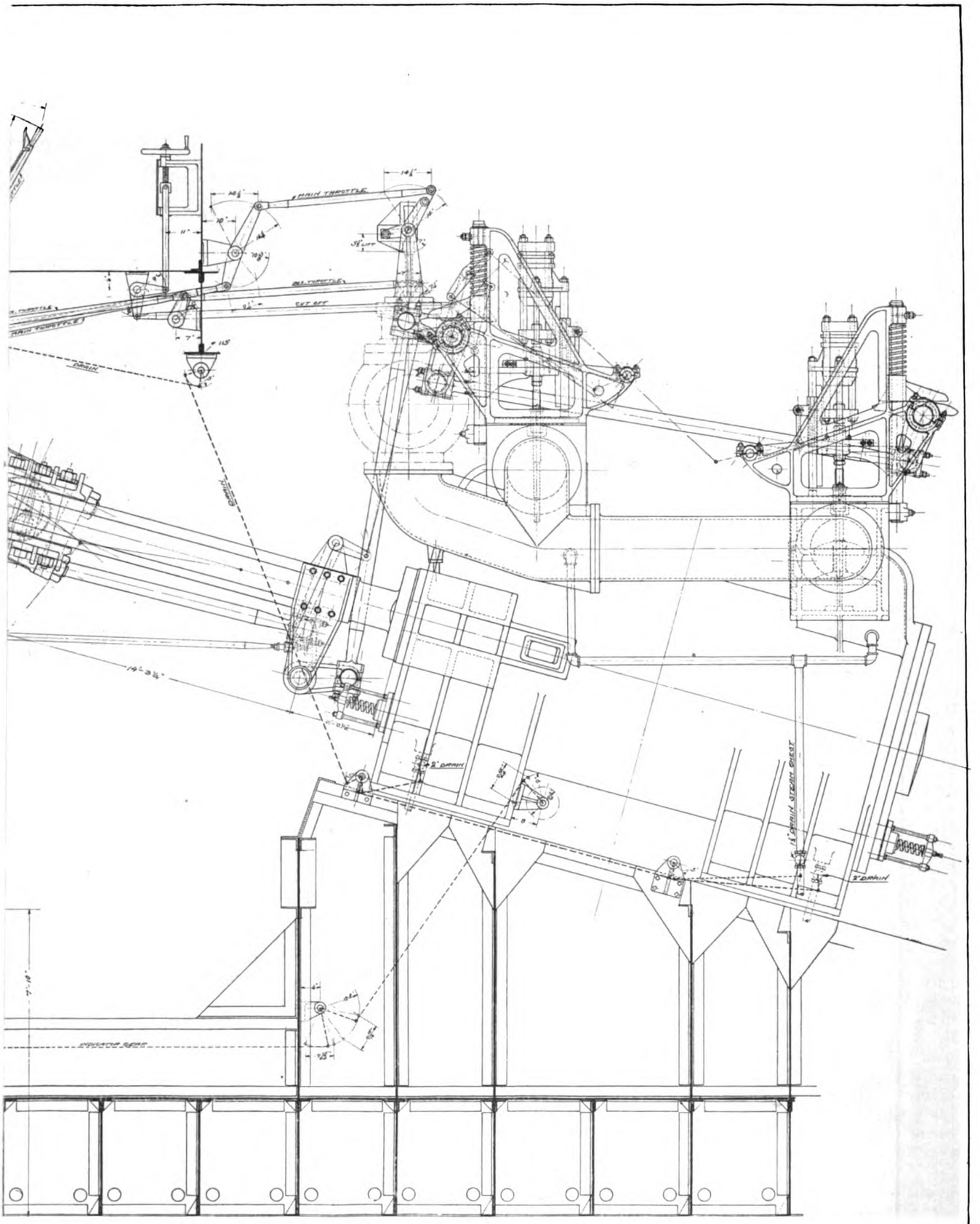
The second point concerns the lubrication of the piston rings and of the piston rod stuffing boxes. The Lentz arrangement avoids rubbing friction in the valve mechanism, but it cannot avoid rubbing friction in the piston. The stuffing boxes are usually special designs of Lentz, after gas engine fashion with numerous intermediate recesses between packing rings of practically no pressure. Doubtless details of successful piston ring packings will be found also that can be used on all such degrees of superheat, as the material of the steam spaces can lastingly endure. The fact remains, however, that the tests of the Drache showed a limit of cylinder lubrication at about 518 degrees Fahr. steam temperature. However, the Drache is only one case, and numerous cases were cited in the discussion of the paper on Letz engines before the German society where the cylinders had successfully worked under temperature up to 750 degrees Fahr., as in the steam yacht Lensahn, of the Grand Duke of Oldenburg. The Grand Duke himself, as president of the German Society of Naval Architects, stated that he was well satisfied with the engine of his yacht, which showed an increased economy of 21 per cent in coal consumption.

The second type, while leaning somewhat upon superheating, is the uniflowing engine, which attempts to reduce initial condensation mainly by letting the steam flow always in one direction, namely from the clearance spaces at the ends with their

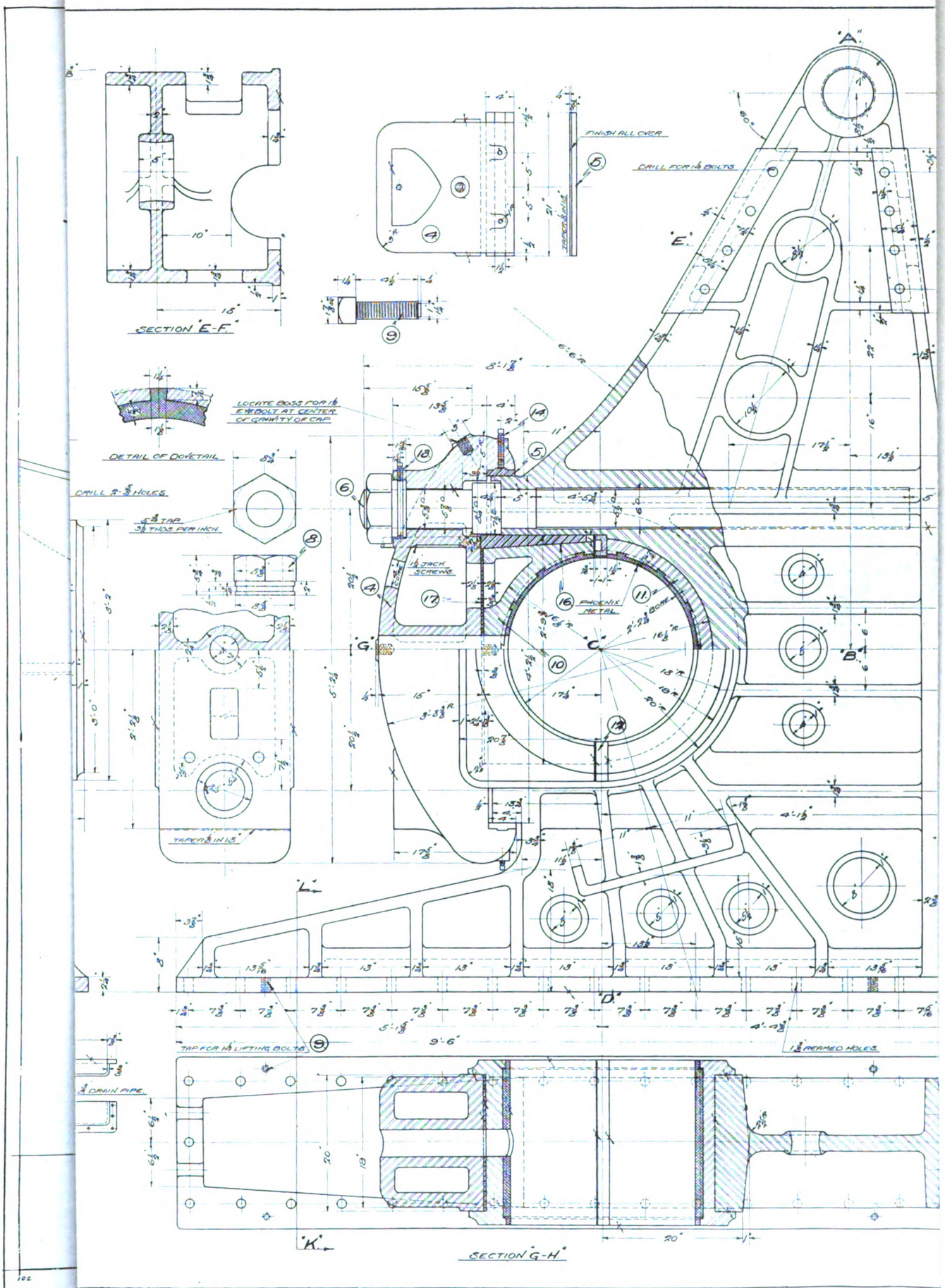




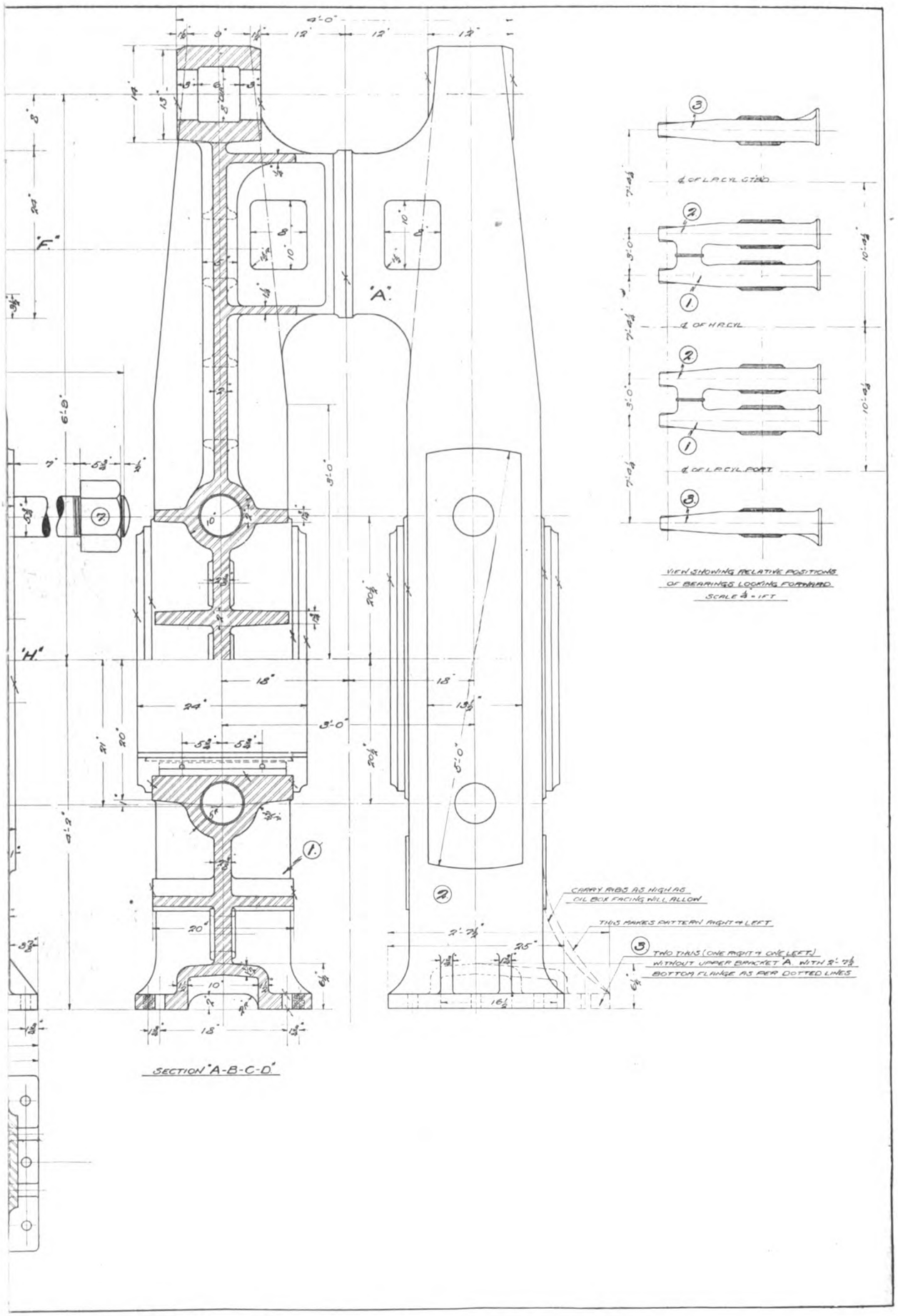
ıgement of the high pressure cylinder of the Cleveland & Bı



ıffalo Transit Co.'s new steamer See-and-Bee.



Main bearing pedestals of the engine of the Cleveland & Buffal



o Transit Co.'s new steamer See-and-Bee.

steam admission members to the exhaust ports at the half length of the working bore of the cylinder. This carries with it a simplification in the valve gear, as the piston itself takes the task of the exhaust valve by overrunning the port, giving exhaust opening at the proper time and starting an invariable and fixed compression at a very early stage of the return stroke. This early and large permanently fixed compression proves exceedingly advantageous to economy, as it superheats the remaining steam to full admission temperature or more, and thereby checks in the most effective way the initial condensation of the incoming steam. This early and large compression has also no drawback upon the steam admission, as the piston is absolutely independent from the valve gear, which may be adjusted to the most favorable or desired steam lap, lead and cut-off. As the steam ports never have to serve as exhaust ports, they may be proportioned purely for steam speeds with the smallest possible clearance. This again contributes materially to the economy by reducing cooling surfaces and accentuating compression temperatures.

The Stumpf engine is designed with a long piston equal to the stroke minus the width of the exhaust slots. There are, however, already other engines on the European market that embody this principle of uniflow, but make the piston only of ordinary length. It can then be used as an operating member for a constant and large compression, but has to be supplemented by an extra exhaust valve over the central exhaust slots for taking care of the proper timing of the exhaust opening. This modification secures all the advantages of the first arrangement, but reduces the length of the cylinder quite materially. For marine purposes, it is more likely to be the best suited and its undoubted economy is proven by the engines built by some German locomobile works and by the stationary engines as built by the Belgian works of Kerrhove. The economies that have been realized by this type in single cylinders are remarkable.

Prof. Stumpf gives in a paper before the German Society of Naval Architects one test of a 100 H. P. single cylinder engine with a steam consumption of 11.84 lb. and 55 degrees Fahr. superheat at engine, and another test of a 500 I. H. P. single cylinder engine with a water rate of 10.12 lb. at 213 degrees Fahr. superheat. By jacket and head heating this has been reduced to about 8.8 lb. in later trials, showing the great importance of maintaining a high temperature in the admission steam. Several marine engines of the Stumpf type are under construction in German ship yards and very likely particulars and tests will be placed this winter before the German society. If these tests prove and further confirm the remarkable economy of this type of uniflow engine, it may prove of far-reaching importance for the further development of the marine reciprocating steam engine. It would seem as if it might, with oil fuel under water tube boilers of very high pressures, lead to fuel economies that nearly approach the fuel economy of the internal combustion heavy oil engine.

Points of Advantage

The principal points of advantage that might reasonably be looked for would be:

I. Simpler engines with fewer cylinders for many cases of reduced first cost and reduced cost of operation.

II. Higher steam pressures, earlier cut-offs and smaller clearances as the most vital factors of increased economy in the engine.

III. Superheating of the steam leading also to better heat utilization in the boilers.

An analysis that would be full and comprehensive enough for clear mechanical as well as commercial judgment must include besides coal consumption also special attendance, interest and depreciation over periods of years.

It is the superheating problem that is really the crux of the possibility of realizing better economy and the question arises most pronouncedly: Is superheating of the steam absolutely essential to higher economies and if so to what extent?

When the possibility of using pressures beyond 300 lb. with a saturated steam temperature of 417.4 degrees Fahr. is considered under the realization that the saturated steam temperature of 450 lb. pressure is only 456.6 degrees Fahr., or an increase of only 39.2 degrees Fahr., then the great gain of power as well as the extreme difficulty of maintaining such a pressure and temperature intact are readily apparent. The least amount of cooling in pipes or engine will send the pressure tumbling down at the most startling rate. For the maintenance of such high pressures superheating of the steam alone would seem to be able to provide that margin that could effectually prevent liquefaction of some of the steam. The tests of the Drache indicated that for normal commercial conditions steam temperatures might without undue complication be run up to 535 degrees Fahr. or even 560 degrees Fahr. Referring this to 450 lb. pressure, it would seem that superheat of 80 degrees Fahr. to 100 degrees Fahr. can readily be obtained before trouble with lubrication of cylinders, piston rings and stuffing boxes need be looked for.

Effect of Superheated Steam

Also tests of steel and iron material under temperatures up to 550 degrees Fahr. have shown that a perceptible reduction of strength or deterioration does not ordinarily occur below these temperatures.

This, however, can not be said of bronze, brass or copper, emphasizing the need for their replacement by cast or forged steel in plants employing superheated steam. Fig. 3 shows also that even for turbines, which are virtually uniflow engines, the first 50 degrees Fahr. to 100 degrees Fahr. of superheat are the most effective as avoiding the very largest share of initial or subsequent condensation. It would seem as if a superheat of 80 degrees to 100 degrees Fahr. with very careful lagging and perhaps reheating between cylinders might secure a fair preservation of temperature that would allow a theoretical comparison as exemplified in Fig. 4. It illustrates two cases that might be considered or are suitable for great lakes steamers.

A represents a case similar to a recent, highly-efficient and successful installation of current type with a quadruple-expansion engine of an extreme ratio of cylinders of 1 to 9.

B represents a hypothetical case that would attempt to produce an equal power in a plain compound of much smaller cost and weight at a consumption of superheated steam less than 60 per cent of the saturated steam used by the quadruple-expansion engine. The race for higher economies is on and owners and builders have to sift carefully and choose wisely to get the best ultimate commercial result from their marine power plants.

It would be a rash conclusion, however, to assume that one type will completely supersede another type or that the new will crowd out much of the old. The engineering experience of the world seems to point rather to a singling out of

special cases, where their characteristics offer an unusually useful field to one or the other power agent. The turbine never replaced the reciprocating engine of current economies in a great many cases and a reciprocating engine of highly increased economy might replace only few steam turbines. For example, in fire boats or dredges, where the main engines might also drive large centrifugal pumps, the turbine would seem to be an ideal motor. Also in multi-screw shallow river steamers an electrical power transmission from one non-reversible turbine to numerous reversible motors and propellers, or to auxiliaries, might prove exceedingly useful.

It is the privilege of the modern engineer to choose from so many power agents the one that will turn in highest efficiency and security the forces of nature to useful service of man.

Suction Experiments

In view of the general lack of experimental data as to the magnitude of the mutual forces involved in the causes of interaction or suction between two vessels moving in parallel paths in close proximity, and as to their effective range of action, prompted by the collision between the Olympic and the Hawke in the Solent last fall, Prof. A. H. Gibson and J. Hanney Thompson decided to carry out a series of experiments to investigate these points on boats of sufficiently large size to enable the results to be applied with some confidence to sea-going vessels. The vessels used were the steam yacht Princess Louise and a motor boat. Each is propelled by a single screw and their leading particulars are as follows:

Vessel.	Keel, ft. in.	Beam, ft. in.	Draught, ft. in.	Rudder area, sq. in.
Princess Louise..	88 6	13 0	6 for'd 7 aft.	...
Motor-boat	29 6	6 9	2 3	100

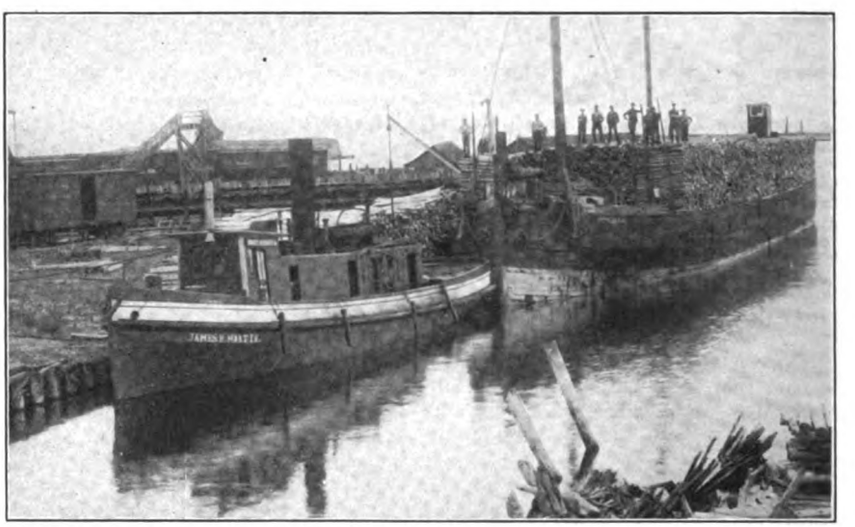
Two sets of experiments were carried out and the results have been submitted to the British Association. In the first, the helm of the motor boat was lashed amidships with the vessels on parallel paths and its behavior was noted when at different lateral distances and when the boats were moving at different absolute and relative speeds. Its position relative to the Princess Louise was determined by angular measurements taken from the latter vessel at intervals of 15 seconds. Pressures at a series of corresponding points on the two sides of a motor boat were measured at the same instant with a view to determining the lateral force involved.

The second series of experiments was devoted to a determination of the helm angle necessary to maintain the course of the motor boat when in different positions relative to the larger vessel.

Owing to possible collision risks, the maximum speed was limited to 6 knots, which, in the case of the Princess Louise, corresponds to 18 knots in a vessel the size of the Olympic. The results show that with both vessels moving at about this speed with helms amidships the smaller vessel is drawn into collision from any lateral distance less than a hundred feet—3½ lengths of the smaller vessel. The precise behavior depends largely on the relative and absolute speeds of the vessels and on their initial distance apart and initial relative position. The experiments prove conclusively that the forces involved in suction are much greater than have been generally realized hitherto. Prof. Gibson and Mr. Thompson were much impressed by the rapidity with which collision usually follows the first sign of suction.

Cargo of Cedar Posts

The accompanying photograph shows the barge Plymouth, owned by Mackinnon & Scott, Menominee, Mich., in tow of the tug James H. Martin, in Menominee river with the largest load of cedar posts ever taken into the port of Menominee. The barge carried 100,000 7-ft. posts.



THE LARGEST LOAD OF CEDAR POSTS EVER BROUGHT INTO THE MENOMINEE RIVER

Battleship New York Launched

The battleship New York was launched on Oct. 30 at the New York navy yard. She is a sister ship of the Texas, building at the yard of the Newport News Ship Building & Dry Dock Co., which was launched on May 12. The launching of the New York was distinguished in the fact that the president of the United States attended. The New York is 573 ft. long 95 ft. beam, having a displacement with all stores and ammunition aboard of 28,367 tons. Her estimated horsepower is 28,100 and designed speed, 21 knots. Her battery will consist of ten 14-inch guns and 21 5-inch rapid fire guns.

Sidelight on Earnings

An interesting sidelight on earnings at sea has just come out on the claim of the dependents of the second-class barber on board the Titanic for damages under the workmen's compensation act. The barber received the nominal wage of a shilling a month from the company, but his earnings were as follows: From shaving, $42; from haircutting, $11.50; from shampooing, $12.50; from tips, $7.50 to $10, and from trading in toilet articles, $47.50, a total of $121.00 for the trip. Contrast these figures with what a stoker gets. In addition, of course, the barber gets his board and lodging free.

In September there were built or building 224 vessels on the Isherwood system with a total tonnage exceeding 1,000,000. Seventy-five of the vessels, with a total tonnage of 392,000 tons, are oil tankers. Of the total tonnage now under construction in the various parts of the world for carrying oil, nearly 76 per cent is on the Isherwood system and to classification in Lloyd's Register.

Launch of the Frieda

There was launched on Saturday, Oct. 26, from the yards of the Fore River Shipbuilding Co., at Quincy, Mass., the bulk cargo steamer Frieda, to the order of the Union Sulphur Co., from the designs of George Simpson, naval architect, New York City. The vessel was christened by Miss Adeline H. Snider, daughter of Clarence N. Snider, the treasurer of the Union Sulphur Co.

This vessel is 315 ft. in length and of 5,000 tons deadweight on a moderate draught. The Frieda has been designed especially for the transport of bulk cargoes of low density and for this reason there has been incorporated in her hull, topside and also athwartship ballast tanks, on the Simpson principle, making the holds self-trimming on all four sides, thereby more than doubling her ballast capacity and reducing her tonnage 20 per cent.

The hull has been built to the highest class in Lloyds Register, on what is known as modified transverse framing.

The vessel is of the single deck, poop, bridge and forecastle type with propelling machinery installed aft and is rigged with three pole masts, the fore and main having derricks and cargo discharging gear.

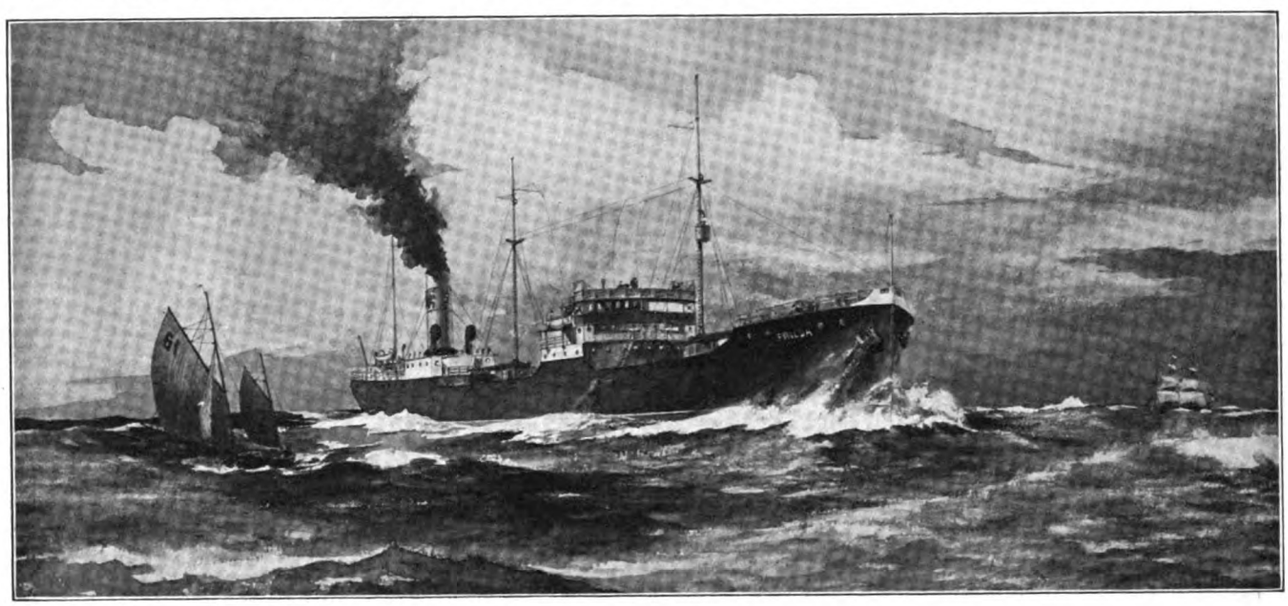
The accommodations comprise separate state rooms for the captain and navigating officers, together with two guests' rooms in the bridge house amidships. The engineers are quartered in a commodious Liverpool house on the poop deck, and the petty officers, seamen, wipers, etc., in wing houses at the forward end of the poop deck. These accommodations will be exceptionally comfortable and go far to establish the superiority of the quarters allotted to American seamen.

The auxiliary machinery comprises a Hyde windlass and steam capstan, Lidgerwood winches and steam steering gear with telemotor.

The equipment of the Frieda is up-to-date in every respect, and consists in addition to the usual articles, a submarine signal, wireless telegraph installation, Morse night signal and a porhydrometer for the automatic weighing of the cargo.

The propelling machinery consists of a 22½ in. triple-expansion engine with two large single-ended Scotch boilers with Howden's forced draft and fitted for burning liquid fuel.

There has been installed in the engine room duplicate sets of 10 kilowatt generators; also two half-ton capacity ice machines to take care of the crew's consumable stores.



THE FRIEDA, OF THE UNION SULPHUR CO.'S FLEET
From a sketch furnished by the Fore River Shipbuilding Co.

The North Atlantic Fleet

When the Atlantic fleet passed in review before the president of the United States, Oct. 15, it carried out to sea no less than 269 machines of the Providence and Williamson make, of which 187 were on twenty-five of the thirty-one battleships in the fleet. Fifty of the ships, including twenty-two battleships, were steered by Williamson steering engines. There were twenty-six Providence windlasses, thirty-one winches and hoists, and fourteen capstans on various vessels. Twenty-five of the ships carried 105 ash hoists, of which eighty-eight were on eighteen battleships. The Wyoming and Florida carried three sets of coaling gears; there were twenty-one ammunition hoists, fourteen boat cranes and five of the famous Providence towing machines.

Most noteworthy of all of these items was the great preponderance of Williamson steering engines on the battleship and armored cruiser fleet, for out of thirty-five vessels no less than twenty-five were controlled by these machines. As practically every case represented was based upon case represented was based upon prev previous experience with the machines, it is perfectly clear that the United States government has the utmost faith in the product of the American Engineering Co., of Philadelphia.

The Bluefields Fruit & Steamship Co. has been organized under the laws of Louisiana to engage in the growing and transportation of bananas and other fruits. The company was formed to take over the property and holdings of the Bluefields Steamship Co. The headquarters of the new company will probably be in New Orleans.

The Dominion government has given an order to Thornycroft & Co., Southampton, Eng., for a customs patrol steamer for service in the Gulf of St. Lawrence, to be 185 ft. long and 32 ft. beam, and will be equipped with two sets of triple-expansion engines driving twin screws. The contract price is stated to be about $275,000.

Isherwood Construction System III

In Which the Author Explains How to Get the Sheer of the Vessel

By Robert Curr

IN THE present article, which is the third of the series, the author explains how to get the sheer of the vessel.

Plate 3. shows the sheer line, deck line on half breadth plan and beam camber. It is necessary to have these three plans in order to run in the sheer lines at side and center.

The sheer line shown here is the line at side and is obtained by dividing the length 203 ft. into eight parts: Four in each body, as shown by ⅛, ¼, ⅜ and ½. The line A B is drawn parallel to the base line on the lowest point of the sheer. The lines ⅛, ¼, ⅜ and ½ are erected perpendicular to same at points giving eight divisions on line A B.

The perpendicular nearest both ends: ⅛ is 55 per cent of the sheer, ¼, 26 per cent, ⅜, 7 per cent and ½, zero.

Example:—

The length of the line A B is 203 ft.: Dividing A B by eighths, it gives 25.375 ft. The half length is marked one half and is on the lowest point of the sheer. The first division from the fore end is marked one-eighth and by setting up 55 per cent of the sheer on this perpendicular, we have 55 per cent of 39 inches, which equals 22.45 inches.

At the second division 50.75 from the fore end we have 26 per cent of 39 inches, which is equal to 10.14 inches.

At the third division 76.125 from the fore end we have 7 per cent of 39 inches, which is equal to 2.73 inches.

Measuring from aft we have 11.55 for the first section, 5.46 for second section, and 1.47 for third section. By holding a batten to these points we obtain the sheer as shown on plan.

The sheer at center can not be obtained by this method and the beam camber must be referred to. If by running a line on the same method here described, it would be found flat, and the beams at ends would have to be made flatter than at amidships.

The next thing to be considered is the width of the deck at side. In this case the deck is 39 ft. wide; in the middle 104 ft. is straight, leaving 43 ft. forward and 56 ft. aft to be faired up.

The half breadth plan shown here, shows three lines, the center line running fore and aft, transverses dotted, lying at right angles to the center line, and the curved line the deck. The sheer line at side and deck width has now been fixed. To get in the line at center, on the sheer plan, it is necessary to refer to the beam camber; as shown here on a larger scale than the other two plans. This camber is shown the full width of the deck of vessel, and the transverses are numbered on it. The camber is 10 in. in 39 ft., and from No. 7 to 24 is the same width; making the ship side at deck straight for over 100 ft. and parallel to the center line.

The line A B is drawn in at right angles to the center line C. and the deck widths 1, 2, 3, 4, 5, 6 and 7 in the fore body, and 24, 25, 26, 27, 28, 29, 30, 31 and transome in the after body, are transferred from the half breadth plan to same. From the line A B the points of half widths are dropped down to the beam camber, and the distance between same is the height of sheer at center above the line at side.

In the designing of the vessel the lines are generally named to suit circumstances. The dotted lines shown here in the sheer and half breadth plans are termed stations when considering displacement, and are arranged differently.

In the meantime I am considering construction for which any lines may be used. The lines in these plans numbered 1 to 31 are transverses and are not likely to be changed in the working plans. The transverses are spaced 6.16 ft. apart. The measurement given in the last article was an error.

The finding of the points for the sheer requires the same process as for fairing up the transverses and level lines. The fairing up of the cross sections and level lines being more tedious and taking longer to secure the fairness. The fairing up of the cross and horizontal sections is done firstly by approximately running in the level lines in the half breadth plan; a sort of free hand process. These lines are transferred to the buttock and bow lines on the sheer plan, then to the body plan, corrections are made until the three plans agree, after which the lines are considered fair.

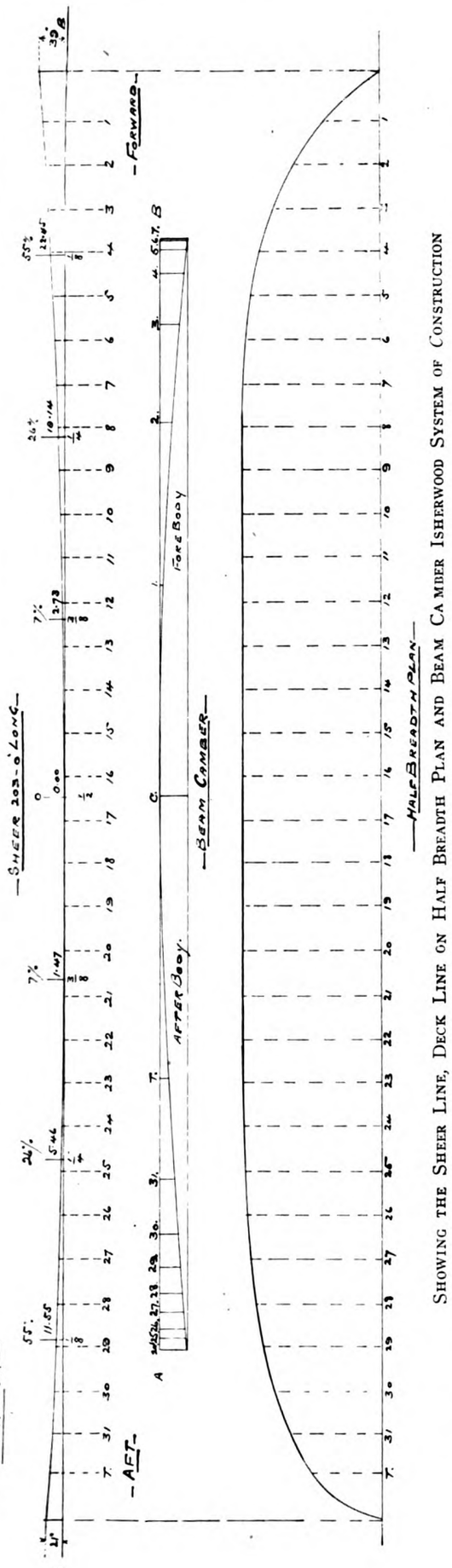
As has been already explained, a bilge diagonal line is run in as a further test of fairness. In the Isherwood construction the longitudinal frames serve as diagonals, and when they have been proven fair, little doubt will be left in the matter of fairness.

Judge Lovett on the Panama Canal

Judge Robert S. Lovett, head of the Harriman Railway System, is of the opinion that the Pacific northwest will be the only part of the United States to derive material benefit from the Panama canal. He argues that the canal will mean a heavy immigration into Washington and Oregon, which will result in greatly developing that part of the country. He does not believe that the Panama canal will disturb freight rates to any extent.

"Of course," he said, "the railroads may lose some of the long haul business, for some of the trans-continental business which is now routed over land will likely go via the canal, but I hold that this fundamental principle will remain true after the canal is open, that is: Whatever is of advantage and benefit to the country at large, will be of benefit to the railroads. As the communities are built up by population flowing in through the canal, the railroads will have more local business to handle, for each new settler will be a producer, and will furnish business for the railroads."

He does not believe the passenger business will develop through the canal so rapidly, or the service be as good, as it would have been if the railroads had been permitted to operate steamship lines through the canal. His argument is that it would cost about $20,000,000 to construct such a fleet as the Pacific Mail Steamship Co. had in mind, and he does not think that any private interest is going to spend that amount of money right away to provide passenger accommodations.



SHOWING THE SHEER LINE, DECK LINE ON HALF BREADTH PLAN AND BEAM CAMBER ISHERWOOD SYSTEM OF CONSTRUCTION

Items of General Interest

The Merrill-Stevens Engineering Co., Jacksonville, Fla., has received contract from the Jacksonville Ferry Co. for a steel ferry boat for river service.

The Maine Central railroad has given contract to the Bath Iron Works, Bath, Me., for a twin screw steel steamer 194 ft. long, 36 ft. beam and 14½ ft. deep.

The four vessels which Cramps, Philadelphia, are building for W. R. Grace & Co., of New York, will be named Santa Cruz, Santa Catalina, Santa Clara and Santa Cecelia.

The amount of the check given to the White Star Line by the underwriters for the loss of the **Titanic** was $4,500,000, the biggest check that has ever been drawn for one loss.

The steamer building at the yard of the New York Ship Building Co., Camden, N. J., for the Pacific Coast Steamship Co. of Seattle will be named Congress.

In consequence of a new law in Russia granting bounties to shipbuilders for merchant ships built within the Russian empire, several British firms are taking steps to acquire shipyards in the Baltic and on the Black sea.

Attorney General Wickersham has directed the New York Ship Building Co. to observe an eight-hour day in construction work upon the battleship Oklahoma, and accordingly the mechanics are working on that basis.

The Coastwise Transportation Co. of Boston has sold the six-masted schooner William L. Douglass to the Sun Oil Co. She will be converted into an oil barge at Cramps, Philadelphia.

The Matson Navigation Co. has given contract to the Newport News Ship Building & Dry Dock Co. for a new steamer to be a practical duplicate of the Durline for passenger and freight service.

The Merrill-Stevens Co., Jacksonville, Fla., has received contract from the Clyde Steamship Co. to build a steamer for its St. Johns River service. The new steamer will be of steel and will be 187 ft. long and 42 ft. beam.

The Philadelphia & Reading railway, which has modern ore handling facilities on its docks at Port Richmond, contemplates modernizing pier 18 along lines similar to the coal piers at Norfolk, Va. It is the intention to equip the pier with car dumping machinery.

The New London Marine Iron Works, New London, Conn., is building a ferry boat, for the towns of Glastonbury and Rocky Hill, Conn.

Obituary

W. B. Davock, for many years identified with lake trade, died at his home in Cleveland, on Sunday, Nov. 3. His death was sudden and came as a great shock to his associates. Mr. Davock was born in Buffalo on July 4, 1846, and settled in Cleveland in the early 70's as a pig iron and ore broker. He later formed a partnership with John N. Glidden under the firm name of Davock & Glidden, and

W. B. DAVOCK

when this firm was dissolved, in 1879, Mr. Davock entered the employ of H. H. Brown & Co., in charge of the pig iron and iron ore departments. In 1890, he took charge of the firm's vessel property, continuing in that connection until his retirement about two years ago. He also managed the lake interests of W. P. Snyder, of Pittsburgh, under the title of the Shenango Steamship Co. Mr. Davock was a director of the Cleveland Folding Machine Co.

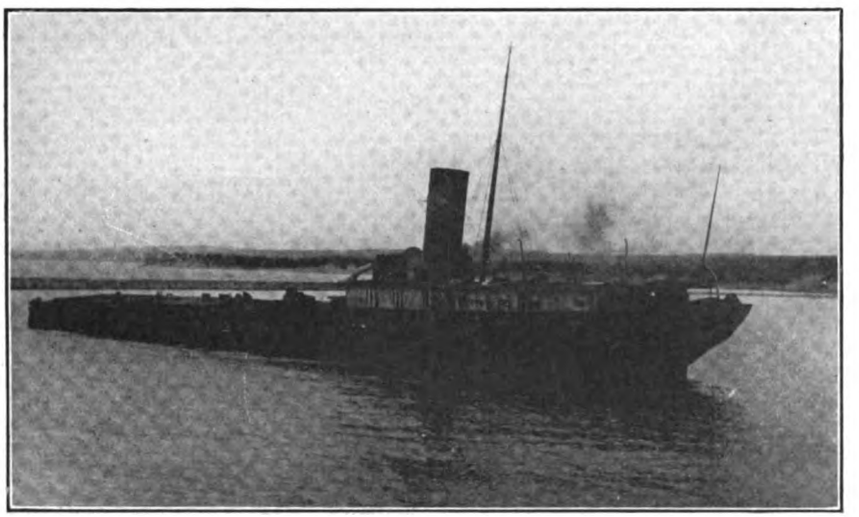
William Horace Corbin, vice president of the Joseph Dixon Crucible Co., died on Sept. 25.

R. W. Curtis, at one time chief engineer of the steamer B. F. Jones, and last year assistant engineer of the Steamer North West, died at Toledo, Sept. 17. Mr. Curtis was well known along the lakes.

Samuel H. Cramp, the son of Wm. Cramp, who founded Cramp's shipyard at Philadelphia, died at his home in that city on Nov. 3, at the age of 79 years. He relinquished the management of the Cramp yard about 15 years ago.

Wreck of W. C. Moreland

The after portion of the steamer W. C. Moreland, which was wrecked off Eagle river, Lake Superior, two years ago, was raised by Capt. James Reid, wrecker, after repeated attempts, successfully bulkheaded and finally taken to Detroit, where she was placed in the Ecorse dock of the Great Lakes Engineering Works. The accompanying photograph is a graphic picture of the wreck as she appeared in the St. Marys river. A survey in the dry dock showed that her bottom is pretty badly damaged. The underwriters offered her for sale, but all the bids received were rejected and new proposals will be solicited, but probably not before spring. Capt. James Reid who has a two-third equity in her will meanwhile act as caretaker.



AFTER PART OF THE W. C. MORELAND, ELEVEN HATCHES IN ALL

October Ore Shipments

Ore shipments during October were 7,010,219 tons, making the total movement to Nov. 1, 43,348,601 tons, thus exceeding the record movement of 1910, when the fleet moved 42,620,201 tons, and still with a month's navigation to spare. It will be recalled that the ore movement slumped severely during the fall of 1909, so that a better criterion of what the fleet is capable of doing in heavy weather is obtained from the November movement in 1909. During that month the fleet moved 4,899,220 tons, and it is pretty certain to move an equivalent or even greater amount during the present month, unless weather conditions should be unusually bad. The total movement for the present year will in all probability be in excess of 48,000,000 tons. In fact, it may be nearer 49,000,000 tons than 48,000,000. It is, therefore, clear that the long dreamed of movement of 50,000,000 tons per annum is about to be realized. It will undoubtedly be achieved in 1913, unless the general state of industry receives a severe set-back.

Shipments by ports were as follows:

Port.	October, 1911.	October, 1912.
Escanaba	677,807	652,894
Marquette	387,436	514,753
Ashland	381.595	759,716
Superior	1,368,893	2.002,767
Duluth	956,342	1,686,324
Two Harbors	997,892	1,393,765
Total	4,769,965	7,010,219
1912 increase		2,240,254

Port.	To Nov. 1, 1911.	To Nov. 1, 1912.
Escanaba	3,764 654	4,663,879
Marquette	1,956,147	3,082,331
Ashland	2,260,381	4,382,877
Superior	9.315,002	13,100,043
Duluth	6,457,706	9,415,511
Two Harbors	5,853,212	8,703,960
Total	29,607,102	43,348,601
1912 increase		13,741,499

Personals

Capt. W. W. Stewart has resigned the position of United States local inspector of hulls at Port Huron.

Harvey D. Goulder, general counsel for the Lake Carriers' Association, has just returned from Europe.

J. F. McCarthy, of Cleveland, has been appointed assistant manager of the lake shipping and fuel department of the Pittsburgh Coal Co.

William K. Kavanaugh, of St. Louis, has been re-elected president of the Lakes to the Gulf Deep Waterway Association.

Rear Admiral Lucien Young, commandant of the naval station at Key West, Fla., died suddenly at the Waldorf-Astoria, New York, on Oct. 3.

Dr. Carl Buenz, the new general representative of the Hamburg-American Line, appointed to succeed the late Emil L. Boas, reached New York on Oct. 3.

H. E. Moore, general freight agent of the Tehuantepec railroad, has resigned to become traffic manager of the Atlantic & Pacific Steamship Co., organized by W. R. Grace & Co.

Calvin Austin, president of the Eastern Steamship Corporation of Boston, recently inspected the Cape Cod canal and believes that it will cut down the steaming time of vessels between New York and Boston by three hours.

Commerce of Lake Superior

The commerce of Lake Superior during October as measured by the traffic passing through the canals at Sault Ste. Marie amounted to 10,716,-791 net tons, making the fifth month in which the commerce has exceeded the 10,000,000-ton mark. The October movement is even greater than that of September, and was only slightly exceeded by the movement of any month since June, certainly a very surprising thing. The total movement to Nov. 1 is 62,669,499 tons as against 47,359,739 tons for the corresponding period during 1911, an increase of 15,309,760 tons. Following is the summary:

	To Nov. 1, 1911.	To Nov. 1, 1912.
EAST BOUND.		
Copper, net tons	104,444	89,988
Grain, other than wheat, bushels	27.021,695	38,256,754
Building stone, net tons	4,367	2,282
Flour, barrels	5,944,766	6,782,396
Iron ore, net tons	28,227,583	42,171,157
Pig iron, net tons	32,905	19,087
Lumber, M. ft. B. M.	485,876	577,794
Wheat, bushels	60,929,021	111,636,750
Unclassified freight, net tons	121,349	203,624
Passengers, number	36,904	31,341
WEST BOUND.		
Coal, anthracite, net tons	1,769,567	1,682,355
Coal, bituminous, net tons	11,894,878	10,937,040
Flour, barrels	125	.....
Grain, bushels	1,350	100
Mfrd. iron, net tons	320.314	523,373
Iron ore, net tons	15,758	6,660
Salt, barrels	550,778	566,487
Unclassified freight, net tons	1,046,575	1,181,047
Passengers, number	41,042	33,794
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	32 230,708	48,254,518
West bound, net tons	15,129,031	14,414,981
	47,359.739	62,669,499

The total number of passages to Nov. 1, 1912, was 19,898, and the net registered tonnage, 49,703,464.

The Howard Shipyards Co., Jeffersonville, Ind., has been taken over by the Howard Shipyards & Dock Co., the incorporators being E. J. Howard, Clyde Howard, James E. Howard, James H. Armstrong and M. Z. Stannard, all of Jeffersonville. The capital stock has been increased to $800,000.

Cramps, Philadelphia, has received the contract from the navy department to build the gunboat Sacramento on its bid of $492,500.

New Hocking Valley Docks at Toledo

Bids will be opened by William Michael, chief engineer of the Hocking Valley Railroad Co. in Columbus, on Nov. 11, for the construction of concrete coal and ore docks, slips and winding basin at the Hocking Valley's new terminal at Toledo. The company contemplates altogether an expenditure of about $2,000,000 at the terminal, though of course a great part of this amount will be expended in eliminating grades, in erecting viaducts and extensive trackage facilities.

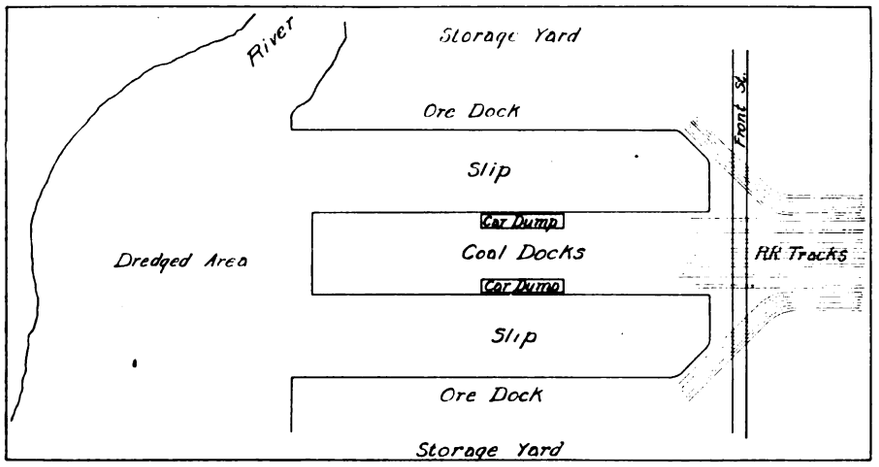


DIAGRAM OF HOCKING VALLEY RAILWAY IMPROVEMENTS AT TOLEDO

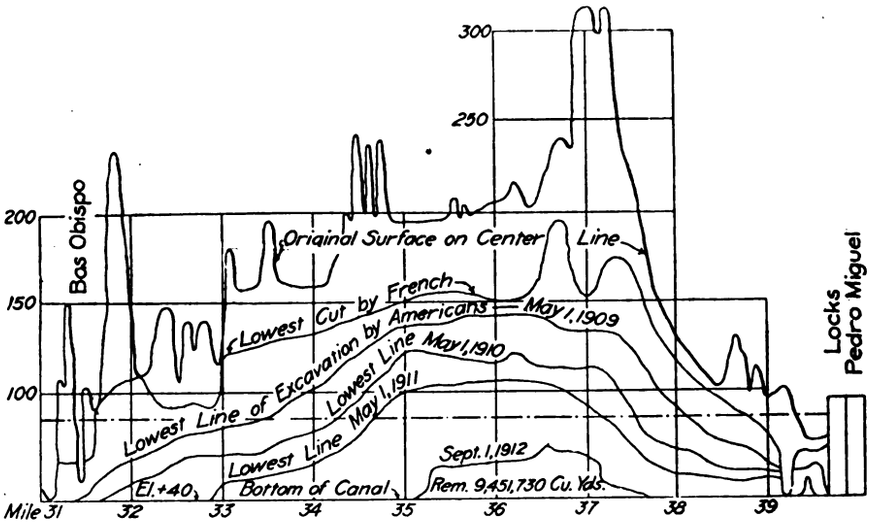
In order to carry out the improvements the city council of Toledo has vacated Front street and the traffic at this point hereafter be cared for by a viaduct. When the improvements are completed the coal trade of the Norfolk & Western railroad will be diverted from Sandusky to Toledo. The Hocking Valley now handles 2,500,000 tons annually at Toledo, but the new coal dock will have capacity for about 5,000,000 tons. The coal dock will have water approach on both sides, the face of the dock being 877 ft. long, and will be equipped with two car dumps. The two ore docks will also have an equivalent water front. The specifications call for a concrete wall on pile construction 1,700 ft. long and 2,000 ft. of cribbed dock construction, the cribs being 26 ft. deep and 37 ft. wide, made of 2-inch material. The crib work will have a superstructure 15 ft. deep and 9 ft. wide of concrete. The work calls for 400,000 yards of dredging, 3,000,000 ft. board measure of timber in the cribs, 21,000 yards of concrete and 143,000 lineal feet of piling. The dredged area is to have a depth of 23 ft. below mean lake level. The general arrangement of the yard is shown in the accompanying sketch.

Work on Culebra Cut

Work on the Culebra cut of the Panama canal is progressing rapidly and at the present rate of progress the excavation work will be completed in five months. Up to Oct. 1, 85,400,000 cu. yds. of material had been removed from the cut. The amount removed during September was 2,124,440 cu. yds. as against 2,443,353 cu. yds. in August, which had the advantage of three working days over September. The estimate of 2,000,000 cu. yds. per month is therefore a fair one, so that by March 1, all excavation work upon the cut should be completed. Practically all of the excavating remaining to be done lies within a distance of about five miles between the new bridge at Paraiso and Lapita Slide. The accompanying profile shows very clearly the earth yet to be removed.

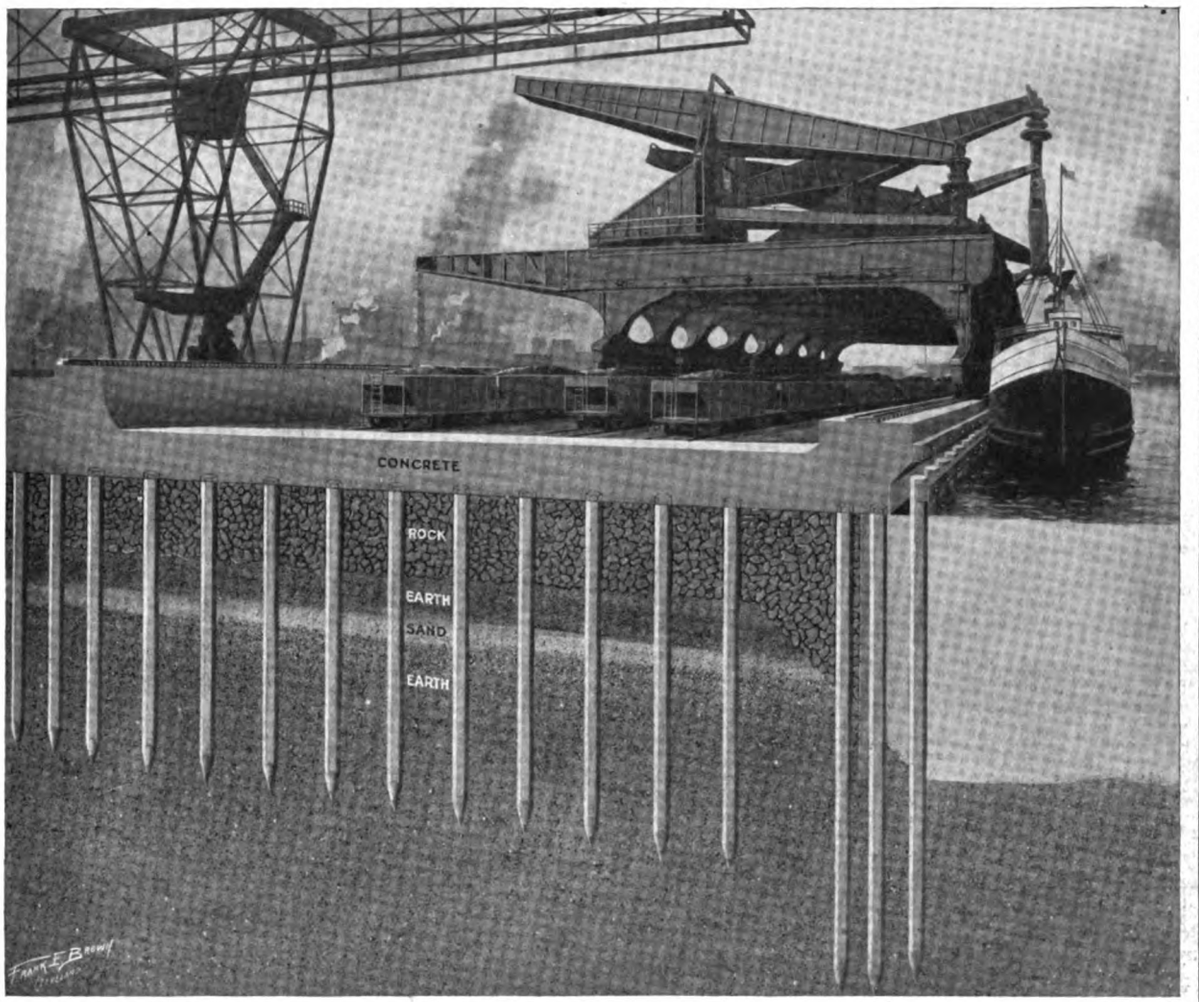
The elevation, however, is not altogether a complete index of the amount of work to be done because of breaks and slides along the embankments. Over 20,000,000 cu. yds. has already been taken out of slides and about 45 per cent of the excavating remaining to be done is due to them. Because the development and extent of slides cannot be accurately estimated, excavation through the cut will be prosecuted with vigor to obviate contingencies. The number of steam shovels at work, which has averaged about 37 since the beginning of the present raining season, is shortly to be increased to 41 or 42. The government has placed July 1, 1913, as the date for finishing the dry excavation, which is a liberal allowance.

As soon as the excavating is completed, water will be let into the cut through the dyke at Gamboa and the ladder dredge Corozal is to be brought into the cut from the Pacific entrance to work at the foot of any slides which continue to develop, in addition to removing the dyke and cleaning out about 150,000 cu. yds. of silting in the completed channel between Gamboa and Mamei. The slides call for no other treatment than unremitting excavation. The plan of excavating at the top, however, has reduced the size of the slides and restricted their menace. It is planned to open the canal to commerce on Oct. 1, 1913.



PROFILE OF CULEBRA CUT, SHOWING PROGRESS OF EXCAVATION

Gilbert Anderson announces his removal to 1025 West North avenue, corner Hawthorne avenue, Chicago. His shipyard will be located at the north end of the canal, one block east of North avenue bridge.



The construction features of this immense ore dock in the outer harbor at Cleveland mark an epoch in American dock design.

The off-shore site of the dock was covered by from 6 to 20 ft. of water. The bottom of Lake Erie at this point was soft clay. A fill made of steel-mill and railroad refuse was made to bring the grade to about 5 ft. above the level of the lake.

More than 5000 pre-molded concrete piles were driven to provide a foundation for the dock walls, the great ore-handling machines, ore piles, power house and auxiliary structures.

The soft bottom would have required a vastly greater number of timber piles. And in many places timber piles could not have been driven through the fill.

Our method of casting concrete piles vertically and curing them properly, enabled us to drive these thousands of piles with no failures.

The speed with which this work was done also is noteworthy. Construction was started on March 11, 1910, and on March 11, 1911, the ore-handling machinery was in service.

Our long and greatly varied experience on substructure work of every class enables us to meet difficult conditions such as this job presented. We are prepared to handle reinforced concrete pile work anywhere. We are in a position to advise on substructure plans or to execute plans already prepared.

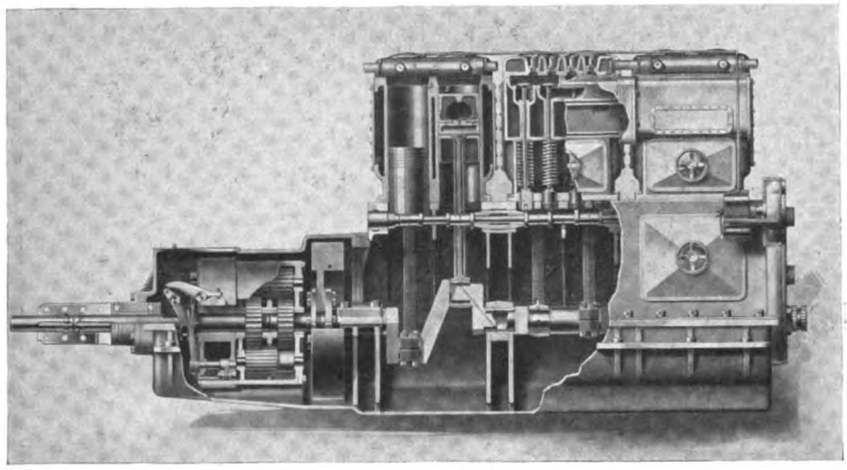
We are organized and equipped to do submarine and pneumatic work of all kinds, river and harbor improvements, dredging, pile driving, foundations, bridges, piers, breakwaters, lighthouses and tunnels.

We are operating in all the harbors on the Great Lakes, with offices in Chicago, Cleveland, Duluth, Sault Ste. Marie, Gary, Buffalo and Amherstburg, Ontario, Canada. Also on the New England Coast, with an office in Boston.

GREAT LAKES DREDGE & DOCK COMPANY

Winton Heavy Duty Marine Engine

The Winton Gas Engine & Manufacturing Co., of Cleveland, intend to put on the market in 1913 a new line of heavy duty marine engines which has been designed under the personal supervision of Alexander Winton. The new line is the fruition of several years' experimentation by the Winton organization in endeavoring to develop a heavy duty engine suitable for either pleasure yachts or commercial boats where reliability, economy, and simplicity of operation are essential. As soon as the company was satisfied with the results, work was started on the erection of a factory to be devoted exclusively to marine power plant manufacture. This plant is now completed and ready for operation and competent authorities declare it to be the most modern of its kind in the country. Everything in it is new and every mechanical facility for the manufacture of gasoline engines of large horsepower in quantities has been installed.



SECTIONAL VIEW OF THE NEW WINTON SIX-CYLINDER, HEAVY DUTY MARINE ENGINE.

The engine design of the new Winton product is of marked simplicity, the exterior being free of the piping and gear, generally so prominent. Accessibility was considered essential and, while all parts are enclosed, the coverings can be easily removed. The cylinders are cast in pairs and ground to mirror smoothness. The cylinder heads are separate castings in which the water intake and outlet is integral. The fuel and exhaust manifolds are cast with the cylinders. Strength and durability is apparent in every part. The connecting rods are steel forgings strong enough to withstand double the strain which they are subjected to. The crankshafts are of chrome vanadium steel, one-half the cylinder bore in diameter. Bearings are of white brass. Throughout the entire construction the aim has been to use the best materials in sufficient quantities to insure long life. A dual ignition system comprising two waterproof magnetos, two spark plugs to each cylinder, is used. An unusual feature is the method of lubrication. Oil is distributed under pressure by a gear pump, to the various bearings, after which it passes through a combined cooler and filter and is again circulated. The same oil used over and over in such an automatic way, not only obviates the necessity of caring for it, but the expense as well.

Horsepower ratings are very conservative, being based on the power developed at normal speed. However, the construction is such that 15 to 25 per cent greater speed can be attained with resultant increase in horsepower development without danger of strain. Regulation is obtained by a centrifugal governor operating on the constant mixture volume throttling principle and can be adjusted for increased or decreased speed.

The company is working on two six-cylinder sizes at the present time, viz.: 6-in. bore, and 9-in. stroke, 75 H. P., 600 revolutions per minute, 9-in. bore and 14-in. stroke, 150 H. P., 350 revolutions per minute. Larger sizes will be added in the near future.

It is also understood that they intend to furnish to purchasers of their engines, an outfit, at reasonable cost, comprising air compressor for starting purposes, generator for lighting and other uses, bilge pump, and the operating power for the set, a small six-cylinder engine, the engine and accessories to be mounted on one base for convenience and space economy.

Selandia's Consumption of Oil

As the consumption of oil is a very important feature in connection with the motor vessel, the following particulars of the Selandia's consumption of this fuel may be of interest. The subjoined table gives some of the worst and some of the best days, and the average speed for the different distances on the outward and the homeward voyage. The weather, especially on the homeward voyage, was anything but favorable, yet oil consumption and speed remained fairly stable; and it is interesting to note that the oil consumption has gone down almost 2 tons per day from the commencement of the trip to its finish. A steamer would have used three to four times as much coal.

OUTWARD VOYAGE.

	Consumption of oil per day in tons.	Speed, knots.
March 11, 1912: The Atlantic; heavy sea; vessel works hard, taking much water over.....	9.8	9.2
March 13, 1912: The Atlantic; vessel rolls, and takes much water over	10.2	10.4
March 14, 1912: The Atlantic; no special weather report.....	10.0	11.5
March 22, 1912; Mediterranean; no special weather report.....	10.1	12.7
March 25 to April 6, 1912; Suez to Colombo; no special weather report; average	10.0	11.5
April 9, 1912; no special weather report; average	9.6	12.4
April 8 to 11, 1912; Colombo-Penang; no special weather report; average	9.6	11.5
April 13, 1912; Penang-Bangkok; no special weather report; average	9.6	11.7

HOMEWARD VOYAGE.

May 11 to 16, 1912: Penang-Colombo; heavy, contrary sea; average	8.8	9.6
May 18 to June 1, 1912: Colombo-Suez; three days' heavy contrary sea, vessel working hard, taking much water over	8.7	10.0
June 2 to 8, 1912: Port Said-Genoa; no weather report; average	8.7	10.4
June 10 to 19, 1912: Genoa-Dover; heavy contrary sea and weather	8.4	9.6
June 19 to 22, 1912; Dover-Aarhus; no weather report...	8.0	10.3

The success of the Selandia and her sister-ship, sold to the Hamburg-Amerika Line, has brought their builders, Messrs. Burmeister and Wain, several orders, and they now have orders for nine motor-vessels, of an aggregate tonnage of 40,000 tons gross, whilst their orders for steamers is confined to one—a screw boat.

May Extend Piers

The war department has decided to permit the steamship companies docking at Hoboken to extend their piers to 1,000 ft. in order to accommodate the great vessels that are now building for the New York service. Both the Hamburg-American Line and North German Lloyd are building vessels that approach 1,000 ft. in length, and the present piers are unable to accommodate them.